Energy, Mines and Resources Canada | Énergie, Mines et Ressources Canada

CANMET

Canada Centre for Mineral and Energy Technology | Centre canadien de la technologie des minéraux et de l'énergie

ISO/TC 102/SC 2/WG 25B and WG 28A
DETERMINATION OF PHOSPHORUS CONTENT IN IRON ORES BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHODS

STATISTICAL ANALYSIS OF INTERNATIONAL TEST DATA - 1986

R. Sutarno and W.S. Bowman
Extractive Metallurgy Laboratory

September 1986

(For submission to the Conveners of ISO/TC 102/SC 2/WG 25B and WG 28A and to the Secretariat of ISO/TC 102/SC 2 and for presentation at the ISO/TC 102/SC 2 meeting to be held in Tokyo, Japan, 1986-11-10/14)

This document is an unedited internal report prepared primarily for discussion and review purposes. It may not represent a final opinion of the Centre for Mineral and Energy Technology (CANMET)

Ce document est un rapport interne non-révisé et rédigé principalement pour discussion et documentation internes. Il ne représente nullement l'opinion définitive du Centre canadien de la technologie des minéraux et de l'énergie (CANMET)

Project: 3.0.6.9.02
Analytical Methodology

99 pp

MINERAL SCIENCES LABORATORIES
DIVISION REPORT MSL 86-116 (IR)

Crown Copyrights Reserved

MICROMEDIA

ISO/TC 102/SC 2/WG 25B and WG 28A
DETERMINATION OF PHOSPHORUS CONTENT IN IRON ORES BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHODS

STATISTICAL ANALYSIS OF INTERNATIONAL TEST DATA - 1986

by

R. Sutarno* and W.S. Bowman**

SUMMARY

The analytical data resulting from the international test on the determination of phosphorus in iron ores by molybdenum blue spectrophotometric method conducted by ISO/TC 102/SC 2/WG 25B and WG 28A during the period of 1984-1986 have been statistically evaluated. Based on these analytical results, the estimates of the precision of the analytical method can be expressed in terms of the phosphorus concentration level by the following equations:

WG 25B	WG 28A
$r = 0.0201\ X + 0.0007$	$r = 0.0350\ X + 0.0011$
$P = 0.0658\ X - 0.0019$	$P = 0.0587\ X + 0.0006$
$sr = 0.0071\ X + 0.0003$	$sr = 0.0124\ X + 0.0004$
$sL = 0.0226\ X - 0.0008$	$sL = 0.0188\ X + 0.0001$

where X is the phosphorus concentration in the sample, r is the repeatability, P is the permissible tolerance, sr is the within-laboratory standard deviation and sL is the between-laboratories standard deviation all expressed in percent. Six samples containing P ranging from 0.004 to 1.5 percent were used in these international tests. Twenty five and twenty one laboratories participated in WG 25B and WG 28A respectively.

---

*Research Scientist and **Technologist, Physical Chemistry Section, Extractive Metallurgy Laboratory, Mineral Sciences Laboratories, CANMET, Energy, Mines and Resources Canada, Ottawa, Ontario K1A 0G1.

ISO/CT 102/SC 2/GT 25B ET GT 28A
DÉTERMINATION DE LA TENEUR EN PHOSPHORE DES MINERAIS DE FER PAR DES MÉTHODES SPECTROPHOTOMÉTRIQUES AU BLEU DE MOLYBDÈNE

ÉVALUATION STATISTIQUE DES DONNÉES RÉSULTANT D'UN ESSAI INTERNATIONAL - 1986

par

R. Sutarno* et W.S. Bowman**

RÉSUMÉ

Les données analytiques qui ont résulté de l'essai international effectué de 1985 à 1986 par les Groupes de travail 25B et 28A du Sous-comité 102 du Comité technique de l'Organisation internationale de normalisation (ISO) en vue de déterminer la teneur en phosphore des minerais de fer par la méthode spectrophotométrique au bleu de molybdène ont fait l'objet d'une évaluation statistique. Selon ces résultats analytiques, l'estimation de la précision de la méthode peut être exprimée en terme du niveau de concentration du phosphore par les équations suivantes:

GT 25B	GT 28A
$r = 0{,}0201\ X + 0{,}0007$	$r = 0{,}0350\ X + 0{,}0011$
$P = 0{,}0658\ X - 0{,}0019$	$P = 0{,}0587\ X + 0{,}0006$
$sr = 0{,}0071\ X + 0{,}0003$	$sr = 0{,}0124\ X + 0{,}0004$
$sL = 0{,}0226\ X - 0{,}0008$	$sL = 0{,}0188\ X + 0{,}0001$

où "X" représente la concentration en phosphore de l'échantillon, "r", la répététabilité, "P", la tolérance permissible, "sr'", l'écart-type de chaque laboratoire et "sL", l'écart-type interlaboratoire, le tout exprimé en pourcentage. Six échantillons dont le taux de tolérance permissible variait de 0,004 à 1,5 pourcent ont été utilisés aux fins d'essais. Vingt-cinq laboratoires étaient représentés par le groupe de travail 25B et vingt et un par le groupe de travail 28A.

---

*Chercheur et **Technologue, Section de la chimie physique, Laboratoire de métallurgie extractive, Laboratoires des sciences minérales, CANMET, Énergie, Mines et Ressources Canada, Ottawa (Ontario), K1A 0G1.

INTRODUCTION

These international tests were conducted in accordance with Resolutions 19 and 20 made at the twelfth meeting of ISO/TC 102/SC 2 held in Paris in 1984 (1).

The analytical data were collected by the conveners of ISO/TC 102/SC 2/ WG 25B and WG 28A (ISO Technical Committee 102 - Iron Ores; Subcommittee 2 - Chemical Analyses; Working Groups 25B and 28A - Determination of phosphorus content in iron ore by molybdenum blue spectrophotometric methods) from the international tests conducted during the period of 1984-1986. Six samples with phosphorus contents ranging from 0.004 to 1.5 percent were used. Twenty five and twenty one laboratories provided analytical data for WG 25B and WG 28A respectively; most analyzed two bottles of each sample in duplicate.

The purpose of this statistical evaluation is to provide the working group with the preliminary estimates of the precision in the form of repeatability, permissible tolerance, within-laboratory and between-laboratories standard deviations.

PRINCIPLE OF THE ANALYTICAL METHODS(2,3)

WG 25B (2)

Fusion of the test portion in sodium carbonate and sodium tetraborate flux and dissolution of the cooled melt in hydrochloric acid. Treatment of an aliquot with sodium sulfate and perchloric acid, followed by conversion of the phosphorus with molybdate and hydrazine sulfate into the molybdenum blue complex. Spectrophotometric measurement of the blue complex at an absorption peak wavelength of approximately 820 nm.

WG 28A (3)

Fusion of the test portion in sodium carbonate and sodium tetraborate flux in a platinum crucible or sodium peroxide flux in a zirconium crucible and dissolution of the cooled melt in hydrochloric acid. Conversion of the phosphorus with molybdate and hydrazine sulfate into the molybdenum blue complex.

Spectrophotometric measurement of the blue complex at a wavelength of approximately 725 nm.

STATISTICAL EVALUATION

The analytical data were statistically evaluated by the procedure described in document ISO/TC 102/TCR 5 (4). This procedure is illustrated schematically in Figure 1.

The raw data and the detailed calculations are presented in Appendices A. They are summarized in Tables 1 and 2. The raw data are also plotted in Figure 2. The boxed points in these figures signify that the data were suspected to be outliers and were excluded from the estimation of the sample means and precisions. The letter C on the boxed points signifies that the data were suspected to be outliers due to poor precision (Cochran's test) and the letter D due to the deviation from the sample means (Dixon's test).

The precisions estimated (sr, sL, r and P) are plotted against their corresponding sample means in Figures 3, and the regression equations of these precisions against sample means were computed and presented in Tables 1. Tables 2 list the suspected outliers.

OBSERVATIONS

An ideal standard analytical method is an analytical method that can be applied by any qualified analyst with proper equipment and reagents with equal precision and accuracy. This implies that, the better the method is standardized, the smaller is the sL/sr ratio, and the fewer the number of outliers. The magnitude of within-laboratory standard deviation itself depends on the state of the art of the method. Experience has shown that for a good method, the average sL/sr ratio is found to be about 2. Tables 1 show that the magnitude of the within-laboratory precision seems to be reasonable. Using sL/sr ratio of 2 as a bench mark, the observed sL/sr ratios are acceptable for WG 28A results and rather high for WG 25B results. Tables 2 show that the number of outliers is reasonable with two laboratories (CA 1 and CA 3) for WG 28A and (AU 5 and SE 2) for WG 25B seeming to have some difficulties.

Comparison between the results obtained by WG 25B and WG 28A (5)

Table 3 shows that, for most samples, WG 28A method obtained higher overall means but poorer precisions than WG 25B. Tables 4 and 5 show that these differences are, in many cases, statistically significant. Only one sample (85-8) showed a higher mean for WG 25B method, but since this was statistically significant, caution should be taken in concluding that WG 28A method obtains higher results.

REFERENCES

1. "Final report of the twelfth meeting of ISO/TC 102/SC 2: Iron ores/ Chemical analysis, Held in Paris, October 16-18, 1984"; ISO/TC 102/SC 2 N792, 1985-03-12.

2. "Iron ores - Determination of phosphorus content - Molybdenum blue spectrophotometric method - Australian method"; Second working draft, ISO/TC 102/SC 2 (WG 25B - 1), January 1986.

3. "Iron ores - Determination of phosphorus content - Molybdenum blue spectrophotometric method - Canadian method"; Second working draft, ISO/TC 102/SC 2 (WG 28A - 2), May 1985.

4. "Procedure for statistical evaluation of analytical data resulting from international tests"; ISO/TC 102/TCR 5, 1985-06-11.

5. "ISO/TC 69/SC 6/WG 1 - Precision of test methods - Determination of repeatability and reproducibility by interlaboratory tests - Comparison of alternative test methods (Third Draft)"; R. Sutarno and W.S. Bowman, MRP/MSL 85-18 (OP&J), November 1985.

Abbreviations Used in this Report

s_r = SIGMA-R - within laboratory standard deviation

s_L = SIGMA-L - between laboratories standard deviation

r* = R - repeatability

= $2.83\, s_r$

p** = permissible tolerance between laboratories

= $2.83\left(s_L^2 + s_r^2/2\right)^{\frac{1}{2}}$

* Repeatability, r, is the value below which the absolute difference between two independent single test (analysis) results produced by a laboratory on identical material using the same equipment within a short interval of time, using the standardized test method, may be expected to be with a 95% probability.

** Permissible tolerance between laboratories, P, is the value below which the absolute difference between two means of duplicate test results on identical material obtained by operators of different laboratories using the standardized test method, may be expected to lie with a 95% probability.

KO - total number of participating laboratories

K - number of sets of laboratory results used for ANOVA

NO - total number of analytical results

N - No. of analytical results used for ANOVA

Table 1.1

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD

SUMMARY OF PRECISIONS FOR ALL SAMPLES

ELEMENT	SAMPLE	KO	K	NO	N	MEAN(X)	REPEATABILITY	PERMISSIBLE TOLERANCE	SIGMA-R	SIGMA-L	SIGMA-L/SIGMA-R
PHOSPHORUS	83-3	28	28	112	112	.0042	.0009	.0013	.00032	.00039	1.20
PHOSPHORUS	77-6	28	26	112	104	.0060	.0009	.0013	.00030	.00042	1.39
PHOSPHORUS	80-1	28	25	112	99	.0171	.0010	.0031	.00034	.00107	3.15
PHOSPHORUS	83-9	28	25	112	100	.1199	.0035	.0086	.00123	.00291	2.37
PHOSPHORUS	85-8	28	24	112	96	.8635	.0172	.0260	.00607	.00813	1.34
PHOSPHORUS	85-9	28	28	112	112	1.4665	.0307	.1113	.01083	.03858	3.56

THE REGRESSION EQUATIONS ARE:

					CORR. COEFF.
R	=	.0201 X	+	.0007	.9992
P	=	.0658 X	+	-.0019	.9361
SIGMA-R	=	.0071 X	+	.0003	.9992
SIGMA-L	=	.0226 X	+	-.0008	.9277

Table 2.1
ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD

LIST OF OUTLIERS

ELEMENT	SAMPLE	COCHRAN (PRECISION)	DIXON (ACCURACY)	LAB HAS ONLY ONE RESULT	INDIVIDUAL OUTLYING RESULT (DIXON)
PHOSPHORUS	83-3	-	-	-	-
PHOSPHORUS	77-6	AU 5	-	-	-
		SE 2	-	-	-
PHOSPHORUS	80-1	AU 5	-	-	SE 2
		CA 2	-	-	-
		SE 1	-	-	-
PHOSPHORUS	83-9	BR 2	-	-	-
		DE 1	-	-	-
		SE 2	-	-	-
PHOSPHORUS	85-8	SE 2	AU 5	-	-
		-	BR 1	-	-
		-	BR 3	-	-
PHOSPHORUS	85-9	-	-	-	-

Table 1.2

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD

SUMMARY OF PRECISIONS FOR ALL SAMPLES

ELEMENT	SAMPLE	KO	K	NO	N	MEAN(X)	REPEATABILITY	PERMISSIBLE TOLERANCE	SIGMA-R	SIGMA-L	SIGMA-L/SIGMA-R
PHOSPHORUS	83-3	21	20	88	84	.0044	.0014	.0017	.00050	.00049	.98
PHOSPHORUS	77-6	21	17	88	72	.0061	.0012	.0014	.00043	.00041	.94
PHOSPHORUS	80-1	21	16	88	64	.0206	.0025	.0053	.00088	.00177	2.02
PHOSPHORUS	83-9	19	18	80	76	.1227	.0059	.0075	.00209	.00220	1.05
PHOSPHORUS	85-8	19	16	79	70	.8532	.0287	.0401	.01013	.01222	1.21
PHOSPHORUS	85-9	19	17	77	69	1.4730	.0541	.0932	.01911	.03001	1.57

THE REGRESSION EQUATIONS ARE:

					CORR. COEFF.
R	=	.0350 X	+	.0011	.9983
P	=	.0587 X	+	.0006	.9877
SIGMA-R	=	.0124 X	+	.0004	.9983
SIGMA-L	=	.0188 X	+	.0001	.9838

Table 2.2

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD

LIST OF OUTLIERS

ELEMENT	SAMPLE	COCHRAN (PRECISION)	DIXON (ACCURACY)	LAB HAS ONLY ONE RESULT	INDIVIDUAL OUTLYING RESULT (DIXON)
PHOSPHORUS	83-3	CA 1	-	-	-
PHOSPHORUS	77-6	CA 1	CA 3	-	-
		CA 3	-	-	-
		SE 3	-	-	-
		SU 2	-	-	-
PHOSPHORUS	80-1	SAMPLE IS INHOMOGENEOUS			
PHOSPHORUS	83-9	-	SU 1A	-	-
PHOSPHORUS	85-8	CA 2	BR 2	US 1	-
PHOSPHORUS	85-9	AU 2A	-	-	-
		BR 1	-	-	-

Table 3

ISO/TC 102/SC 2/WG 25B & 28A
PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHODS
COMPARISON OF THE MEANS AND PRECISION OBTAINED BY WG 25B AND WG 28A

Sample	Mean (x)			r			P		
	25B	28A	Rat	25B	28A	Rat	25B	28A	Rat*
83-3	0.0042	0.0044	1.05	0.0009	0.0014	1.56	0.0013	0.0017	1.31
77-6	0.0060	0.0061	1.02	0.0009	0.0012	1.33	0.0013	0.0014	1.08
80-1	0.0171	0.0206	1.20	0.0010	0.0025	2.50	0.0031	0.0053	1.71
83-9	0.1199	0.1227	1.02	0.0035	0.0059	1.69	0.0086	0.0075	0.87
85-8	0.8635	0.8532	0.99	0.0172	0.0287	1.67	0.0260	0.0401	1.54
85-9	1.4665	1.4730	1.00	0.0307	0.0541	1.76	0.1113	0.0932	0.84

*Rat = ratio of 28A /25B

Table 4

ISO/TC 102/SC 2/WG 25B & 28A
PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHODS
STATISTICAL COMPARISON BETWEEN MEANS OBTAINED BY WG 25B AND WG 28A

Sample	Mean (x) %			$V\{x_1\}$	$V\{x_2\}$	Sd	T	*
	25B(x_1)	28A(x_2)	$x_2 - x_1$	10^6	10^6			
83-3	0.0042	0.0044	0.0002	0.0063	0.0163	0.0002	1.33	I
77-6	0.0060	0.0061	0.0001	0.0076	0.0136	0.0001	0.68	I
80-1	0.0171	0.0206	0.0035	0.0468	0.2272	0.0005	6.68	S
83-9	0.1199	0.1227	0.0028	0.3545	0.3600	0.0008	3.31	S
85-8	0.8635	0.8532	-0.0103	3.1377	11.8269	0.0039	2.66	S
85-9	1.4665	1.4730	0.0065	54.2068	62.9977	0.0108	0.60	I

x_1 = grand mean obtained by WG 25B

x_2 = grand mean obtained by WG 28A

$V\{x_1\}$ = variance of x_1

$V\{x_2\}$ = variance of x_2

sd = $[V\{x_1\} + V\{x_2\}]^{1/2}$

T = $|x_1 - x_2| / Sd$

S = the difference is statistically sinificant

I = the difference is statistically insignificant

* If T is greater than 2, the difference between x_1 and x_2 is statistically significant

Table 5

ISO/TC 102/SC 2/WG 25B & 28A
PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHODS
STATISTICAL COMPARISON BETWEEN PRECISIONS OBTAINED BY WG 25B AND WG 28A

Sample	Within Lab. sr^2 10^4						Between Lab. Mean Squares 10^4					
	s_1	f_1	s_2	f_2	s_2/s_1	*	M_1	fM_1	M_2	fM_2	M_2/M_1	*
83-3	0.0010	84	0.0024	64	2.40	S	0.0071	27	0.0125	19	1.76	I
77-6	0.0009	78	0.0019	55	2.11	S	0.0079	25	0.0088	16	1.11	I
80-1	0.0011	74	0.0077	32	7.00	S	0.0462	24	0.1454	15	3.14	S
83-9	0.0151	75	0.0437	58	2.89	S	0.3545	24	0.2472	17	0.70	I
85-8	0.3689	72	1.0261	54	2.78	S	3.0122	23	7.5101	15	2.49	S
85-9	1.1734	84	3.6526	52	3.11	S	60.7117	27	40.0090	16	0.66	I

s_1 = repeatability variance obtained by WG 25B

s_2 = repeatability variance obtained by WG 28A

M_1 = between-laboratories mean squares obtained by WG 25B

M_2 = between-laboratories mean squares obtained by WG 28A

f_1 = degrees of freedom associated with s_1

f_2 = degrees of freedom associated with s_2

fM_1 = degrees of freedom associated with M_1

fM_2 = degrees of freedom associated with M_2

* If s_2/s_1 (M_2/M_1) is greater than the corresponding critical value of the F-distribution The difference between repeatability variance (between-laboratories mean squares) is statistically significant.

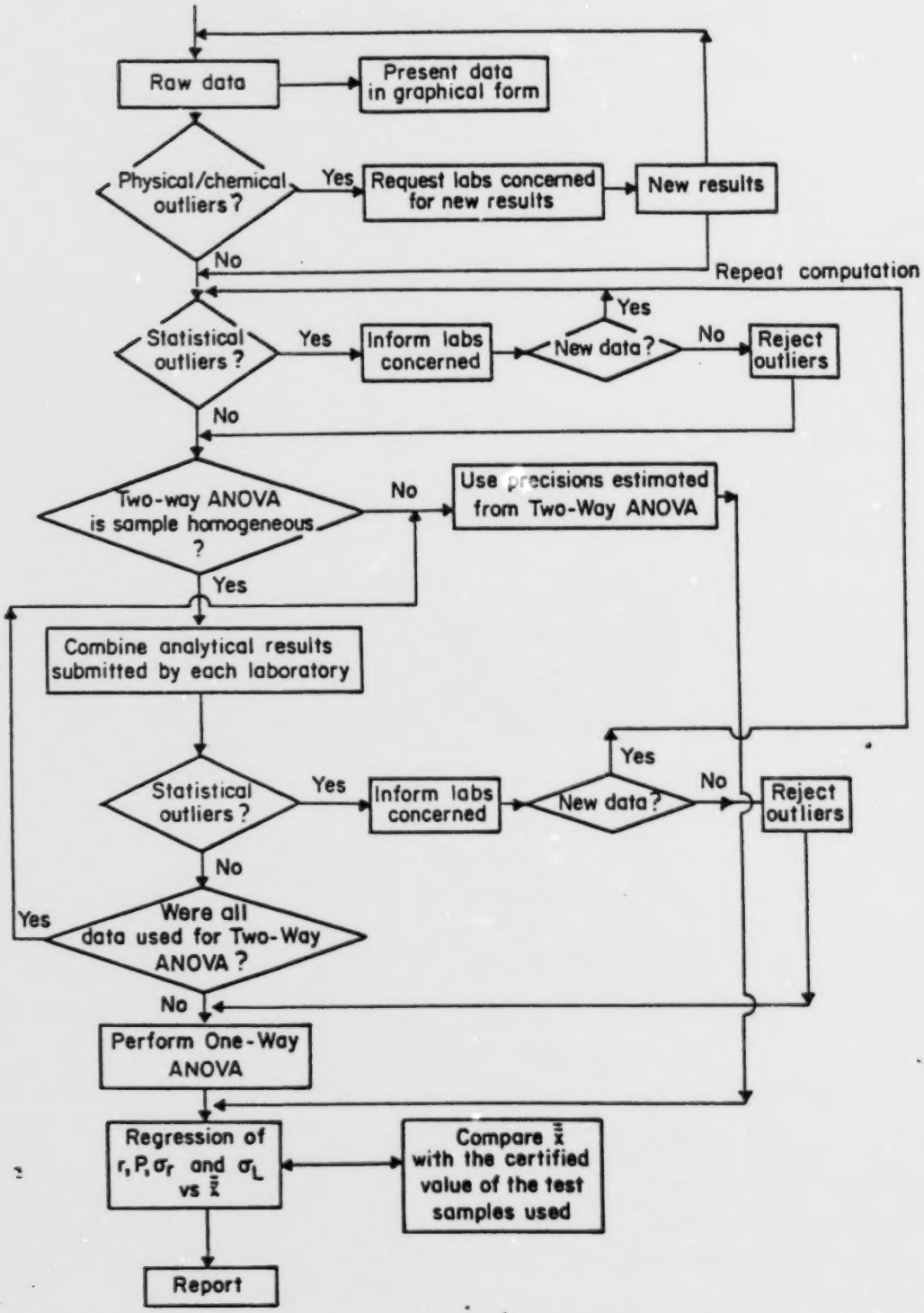

Figure 1. Flow chart of the Procedure for Statistical Evaluation of Analytical Data Resulting from International Tests.

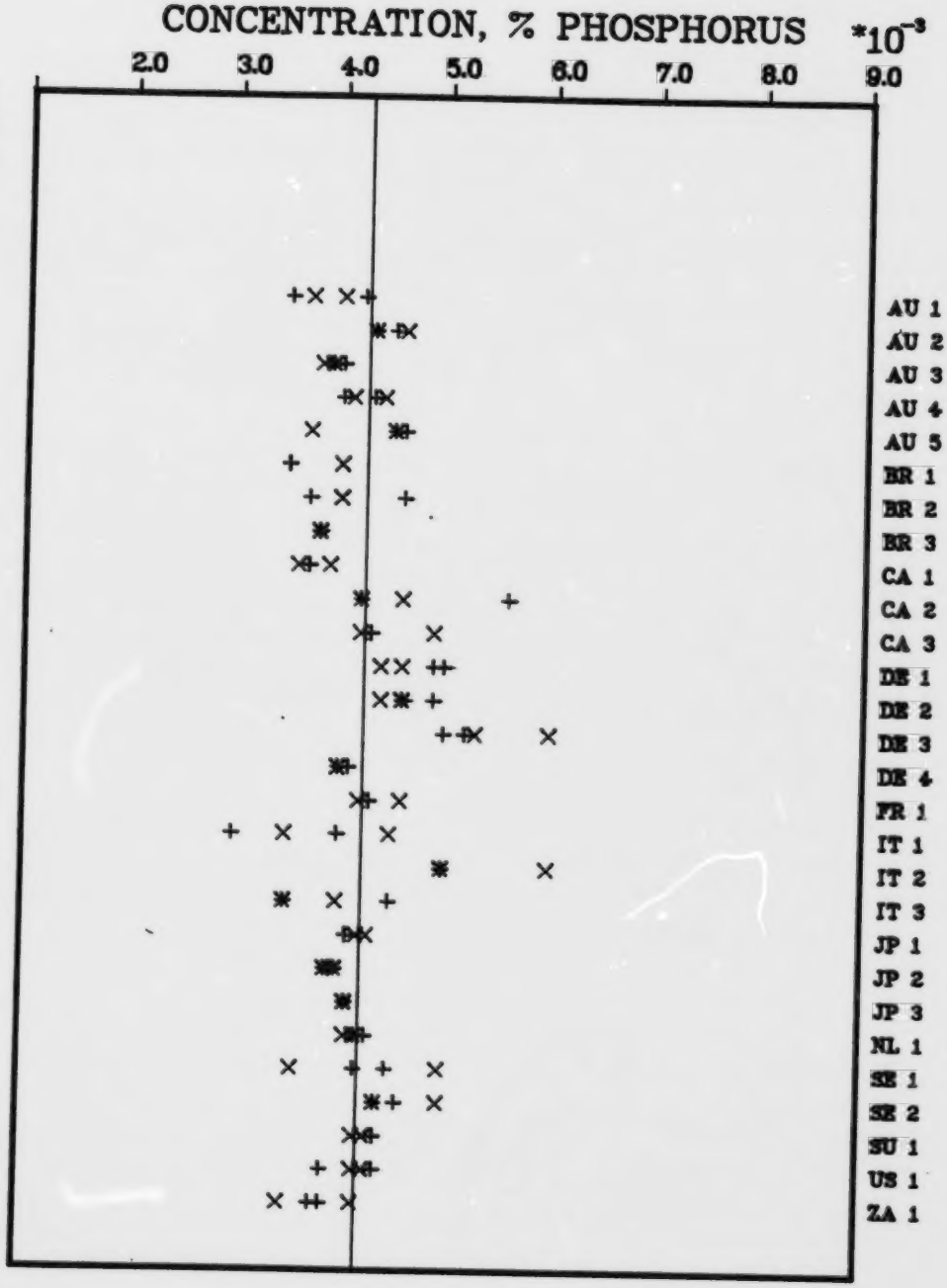

Figure 2.1.A
ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

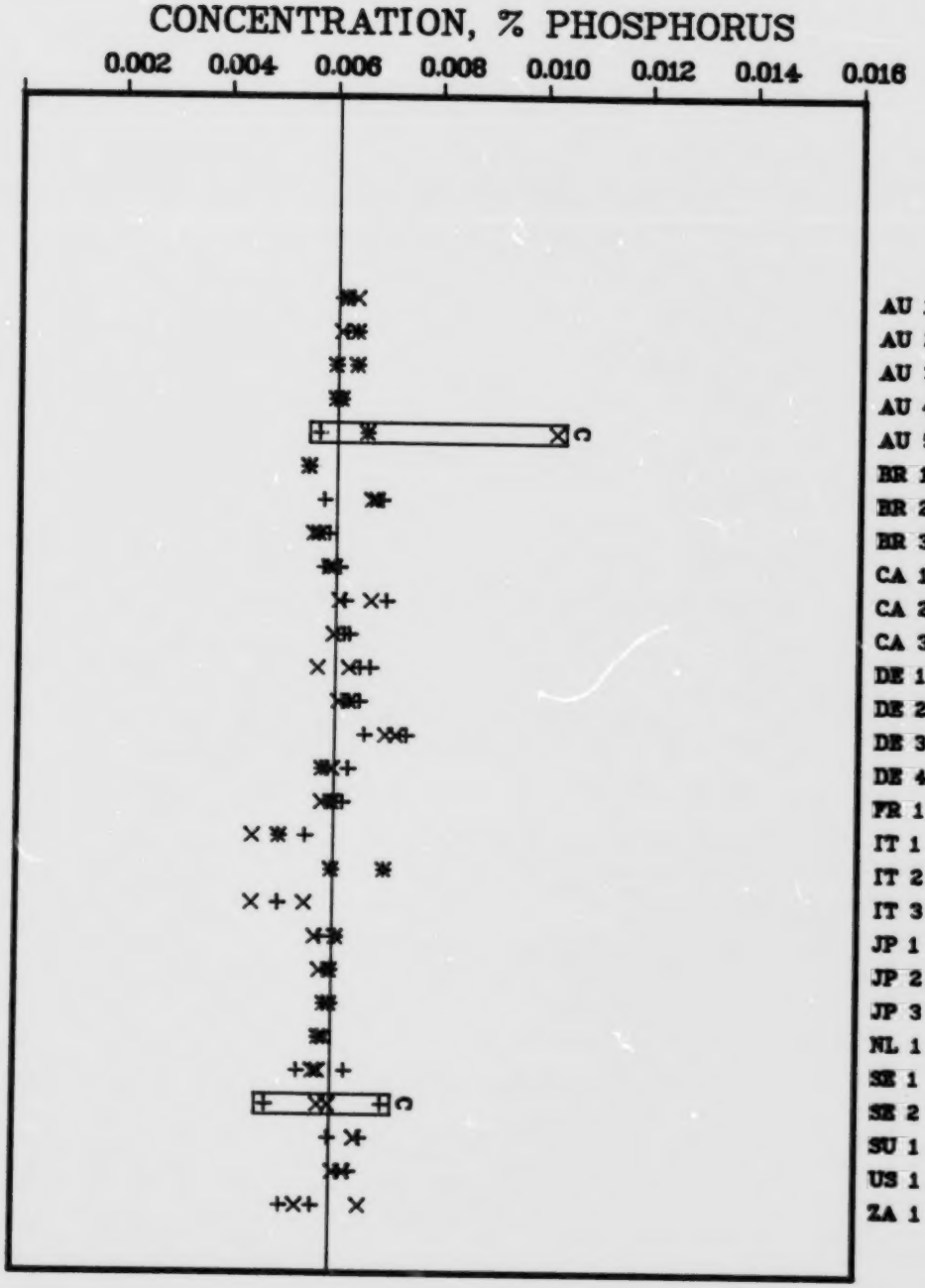

Figure 2.2.A
ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE 77-8

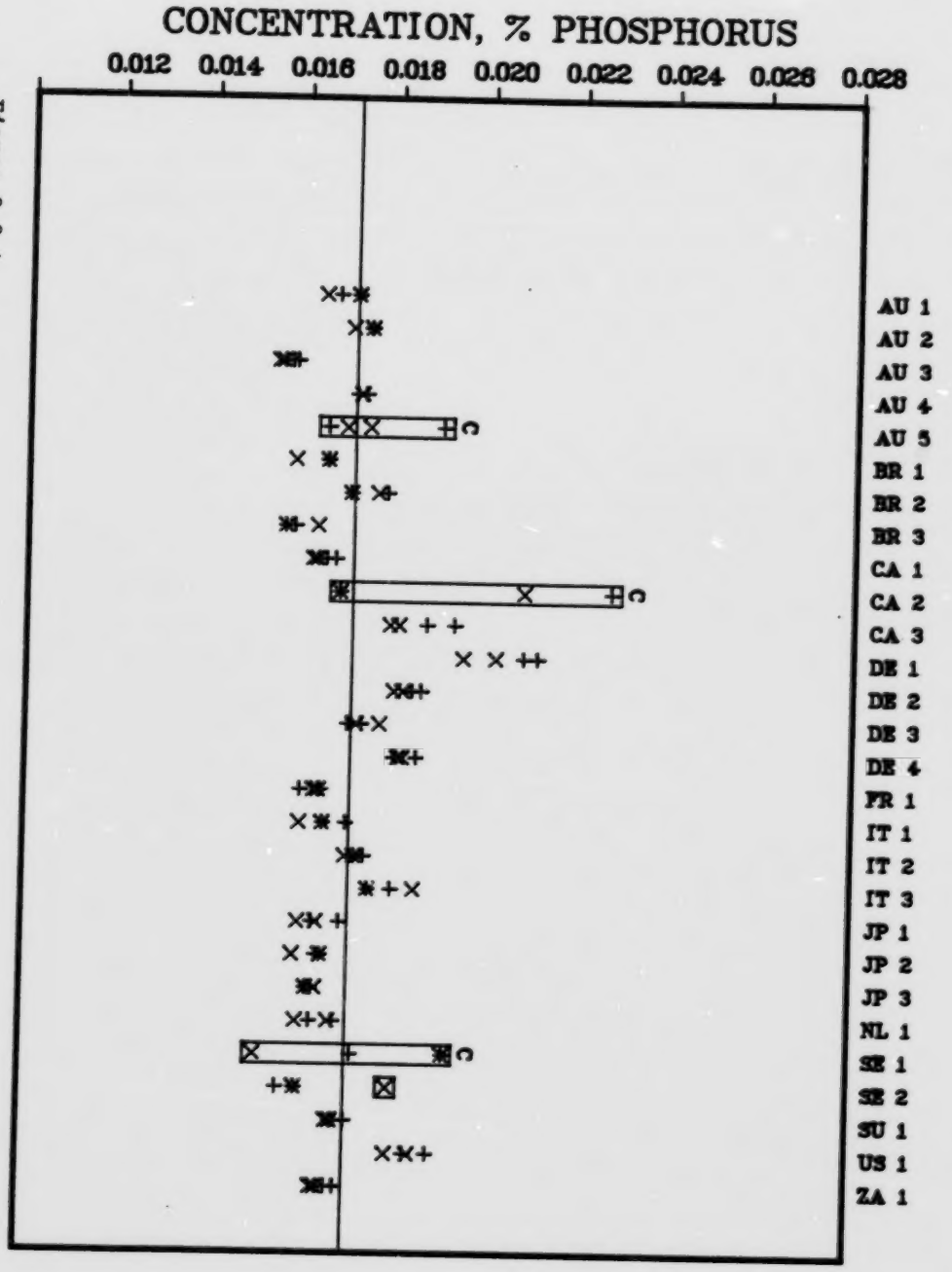

Figure 2.3.A
ISO/TC 102/SC 2/WG 23B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE 80-1

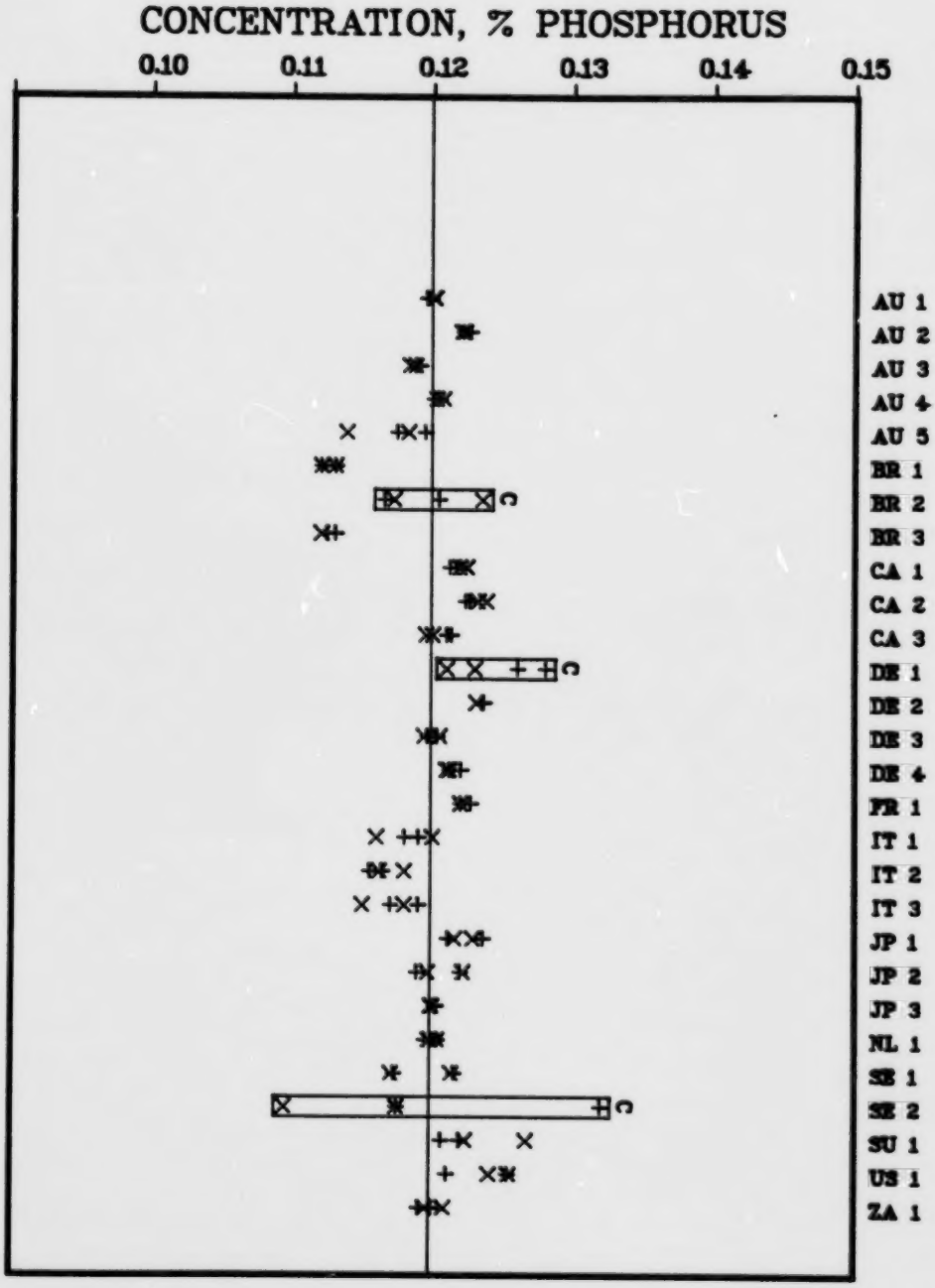

Figure 2.4.A
ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE 83-6

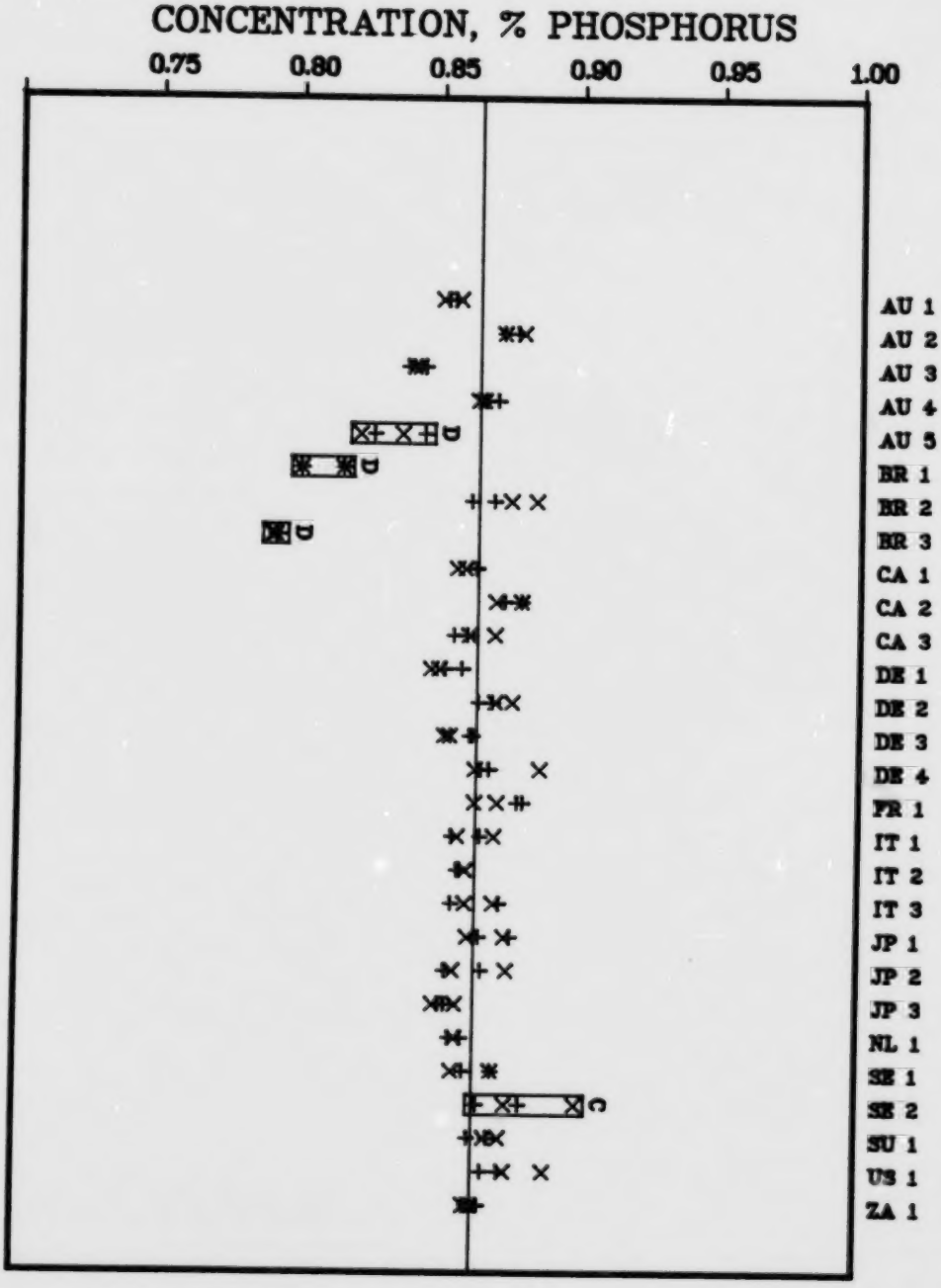

Figure 2.5.A

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD

SAMPLE 85-8

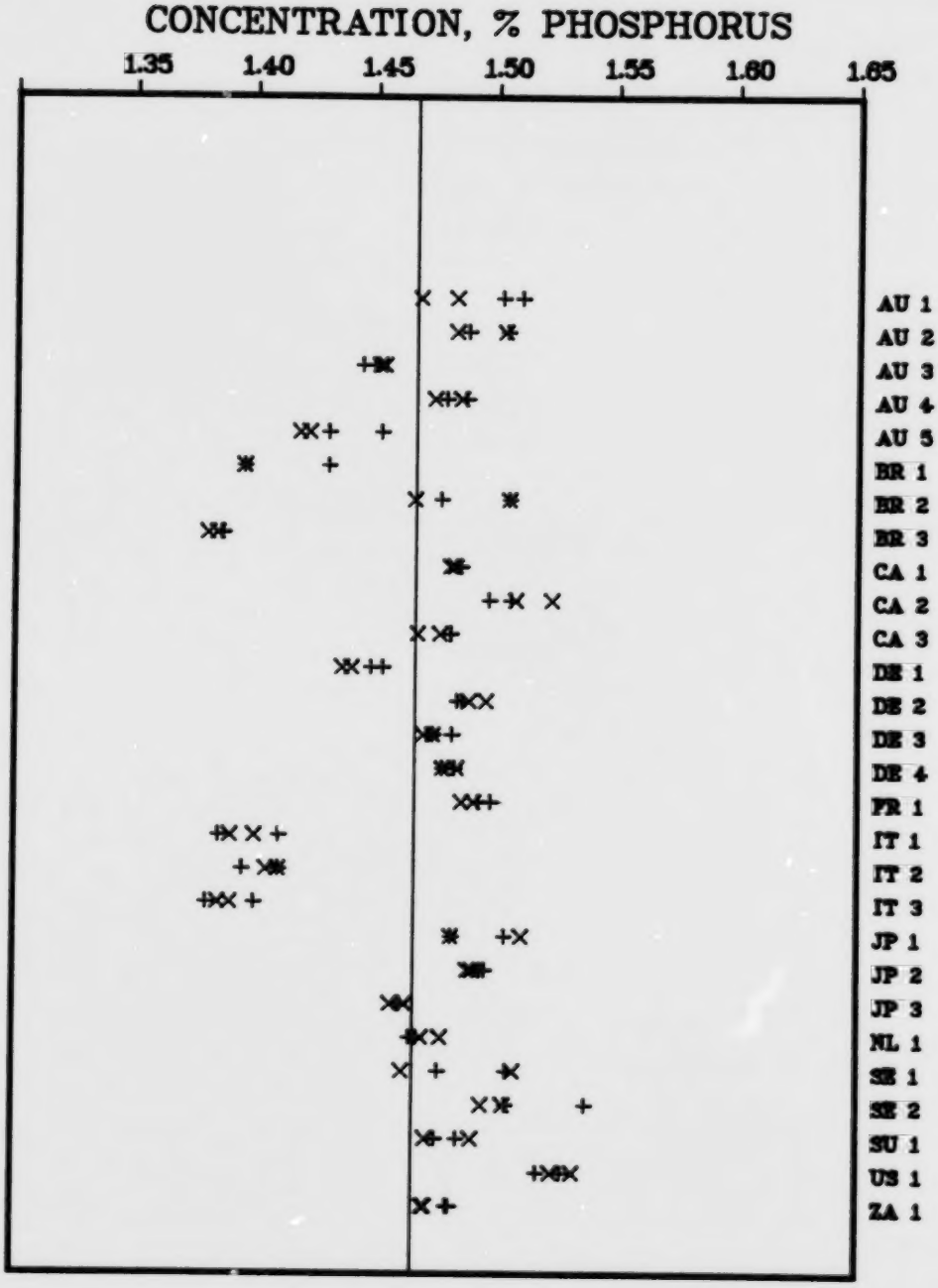

Figure 2.6.A
ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE 85-9

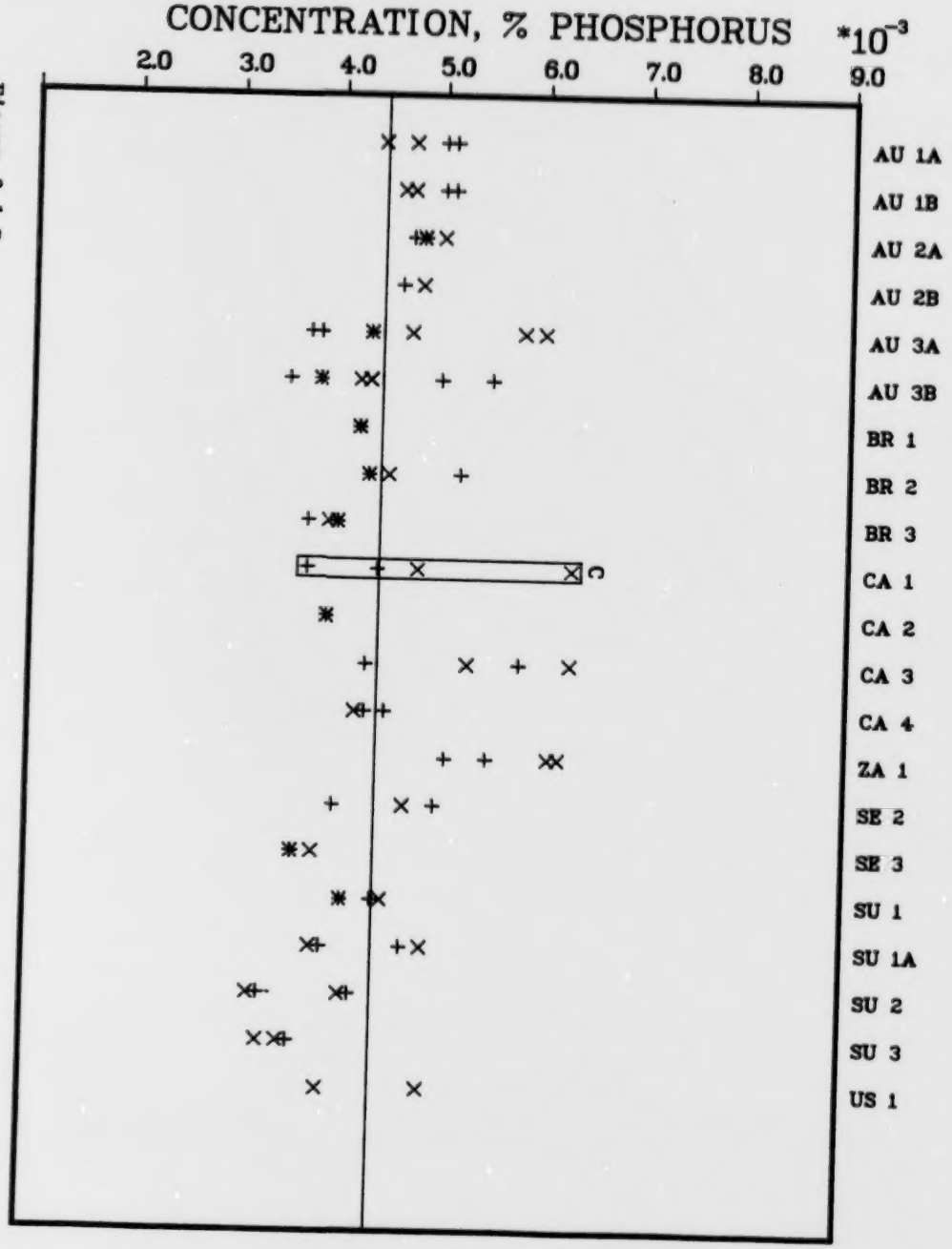

Figure 2.1.B
ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

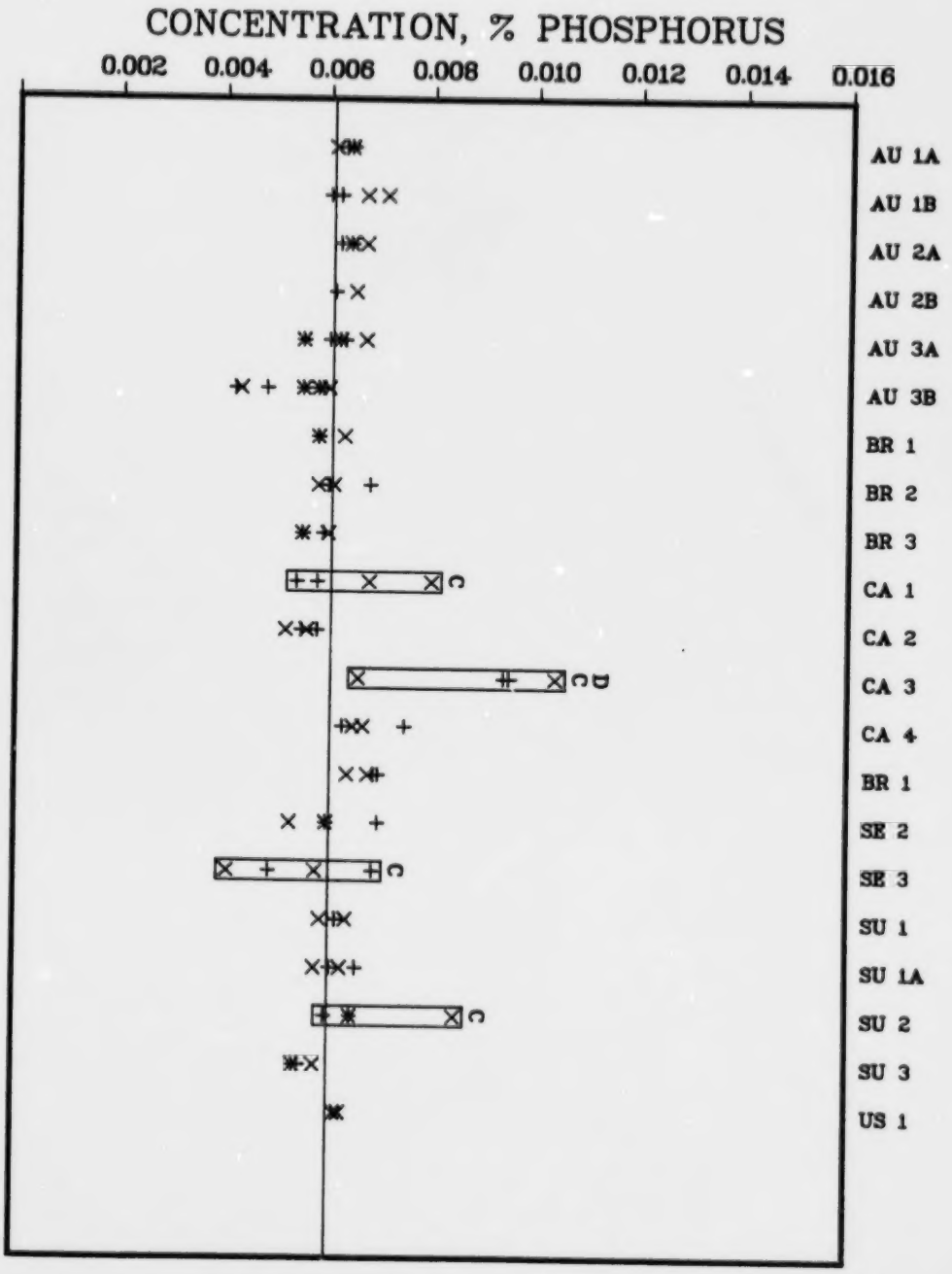

Figure 2.2.B
ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE 77-6

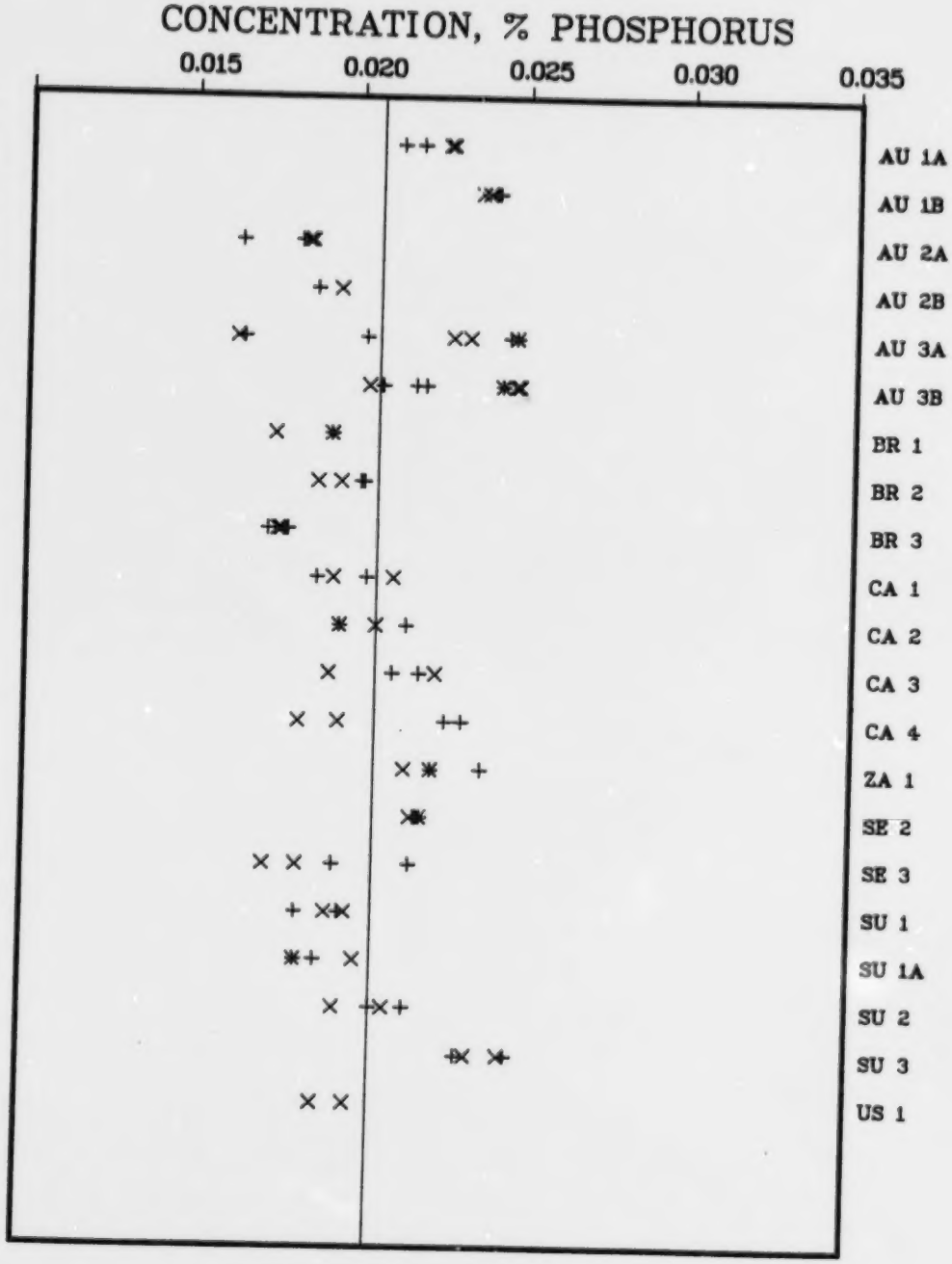

Figure 2.3.B
ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE 80-1

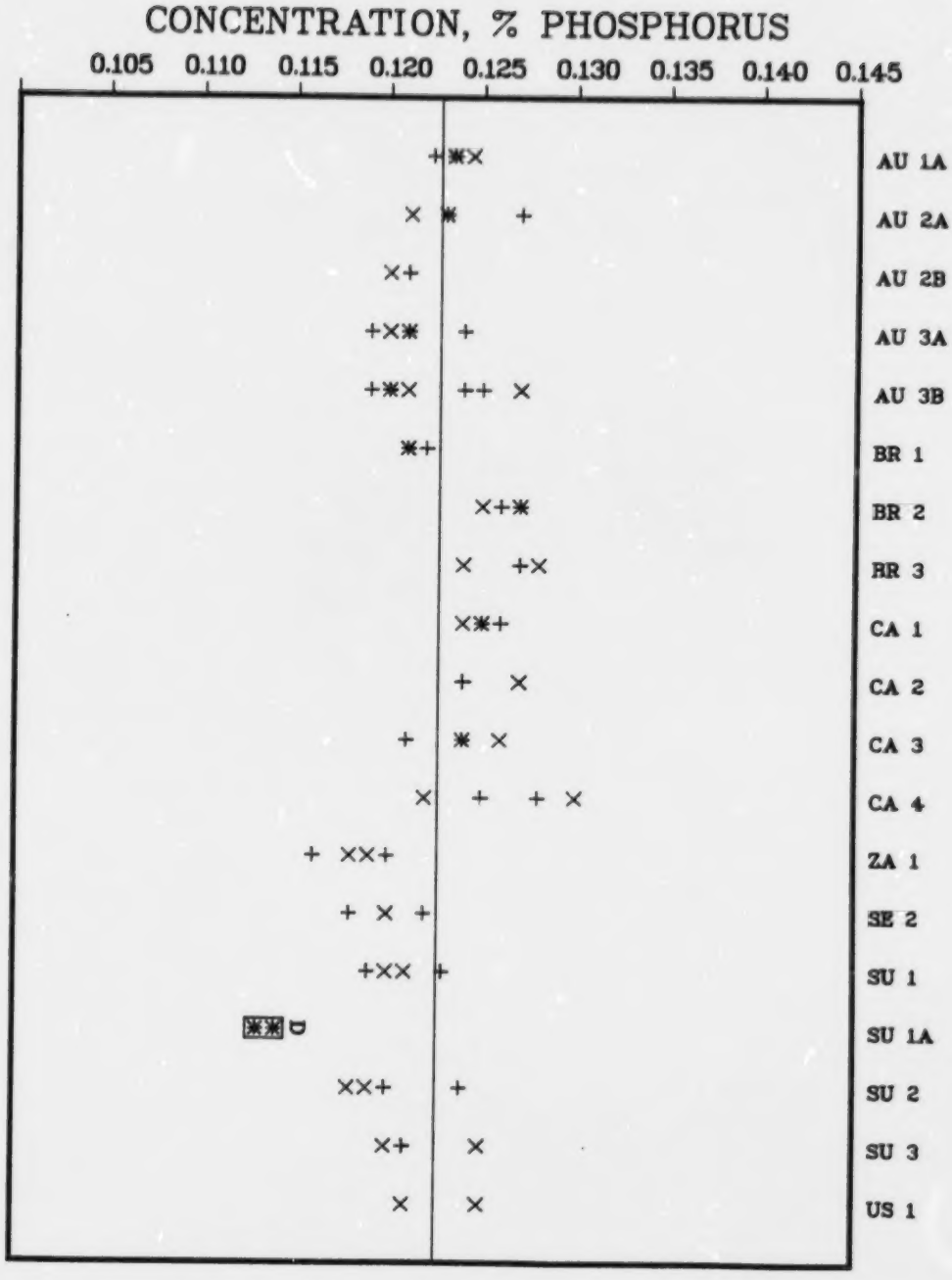

Figure 2.4.B
ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE 83-9

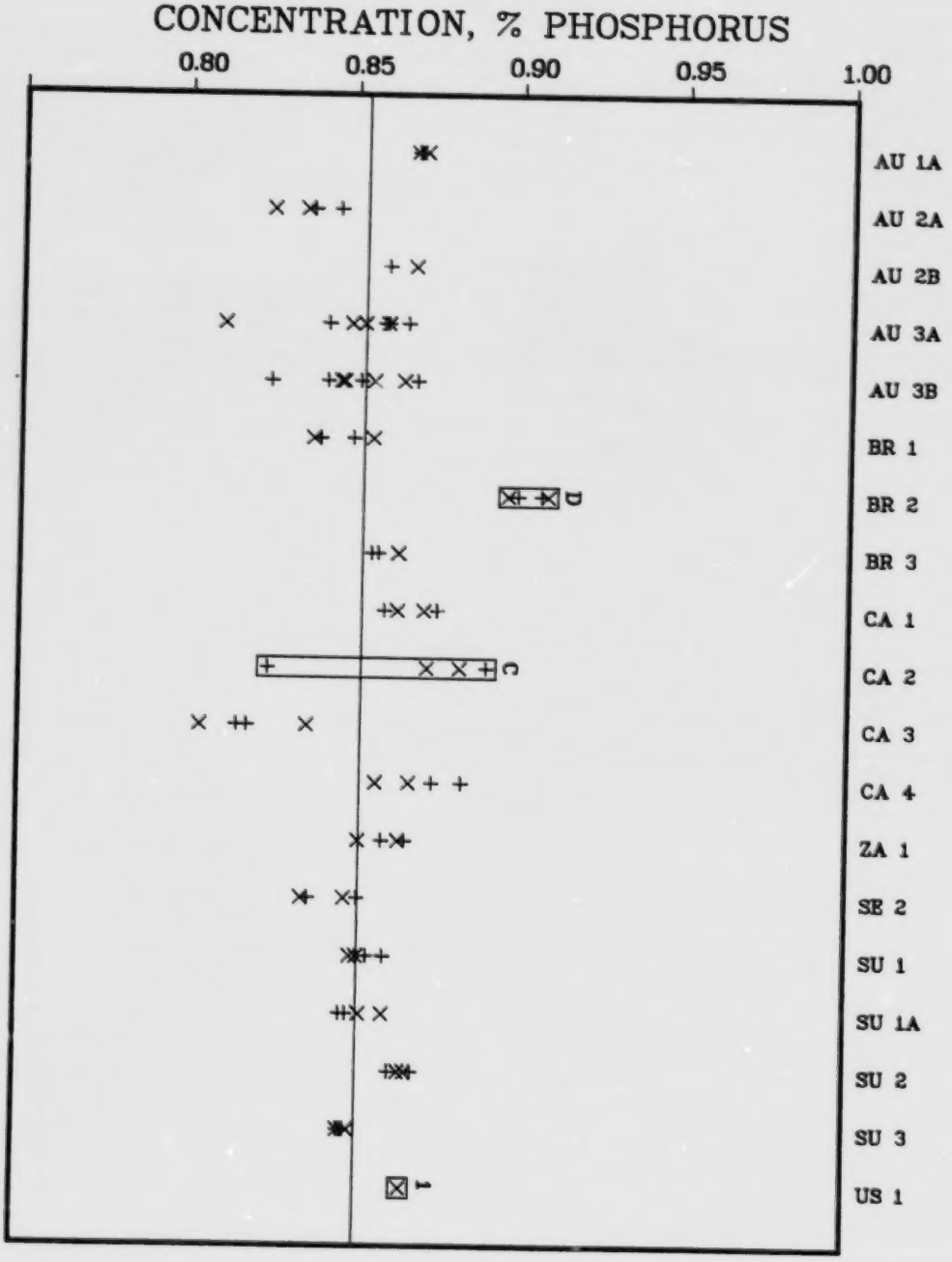

Figure 2.5.B
ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

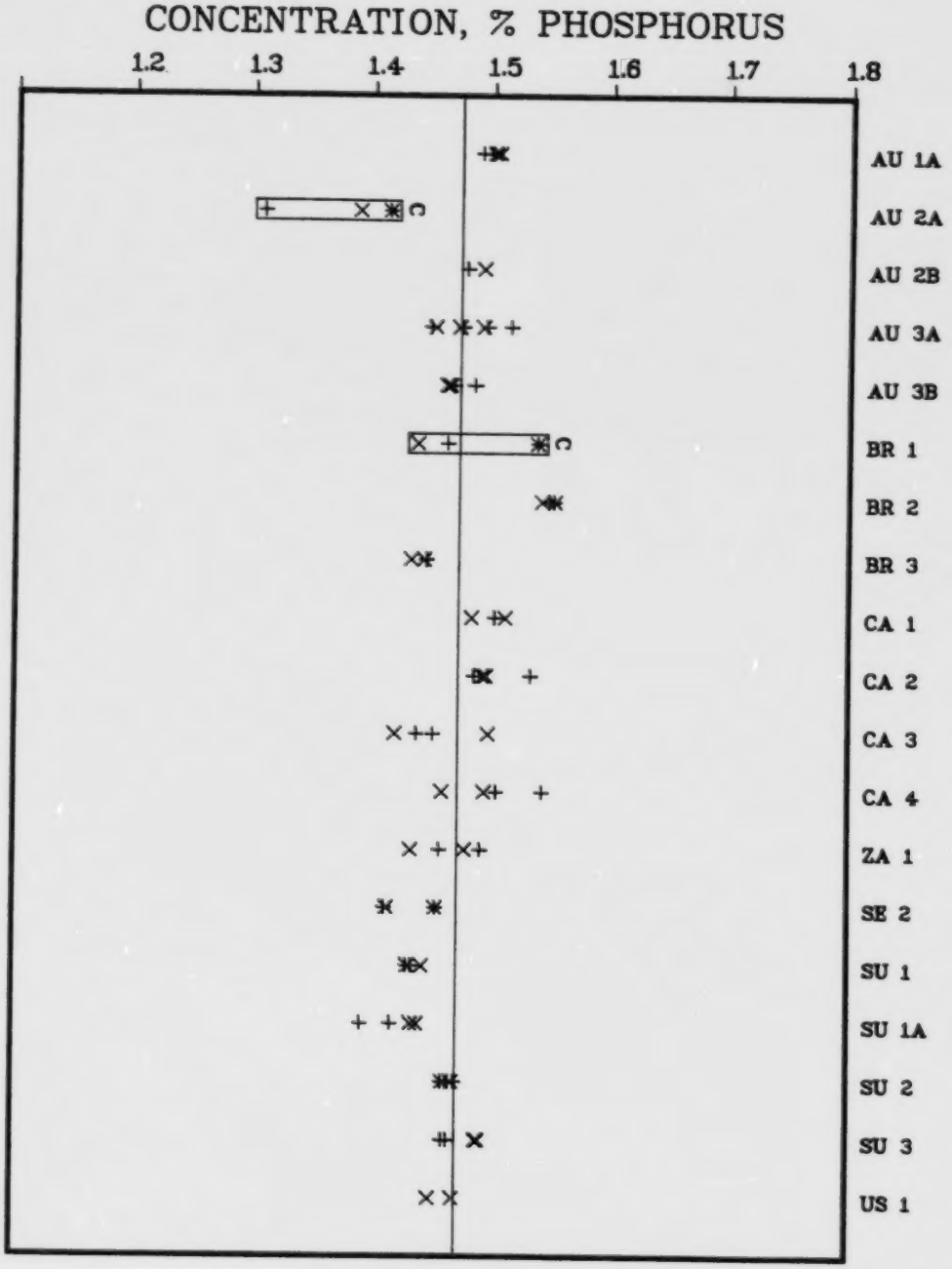

Figure 2.6.B

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD

SAMPLE: 85-9

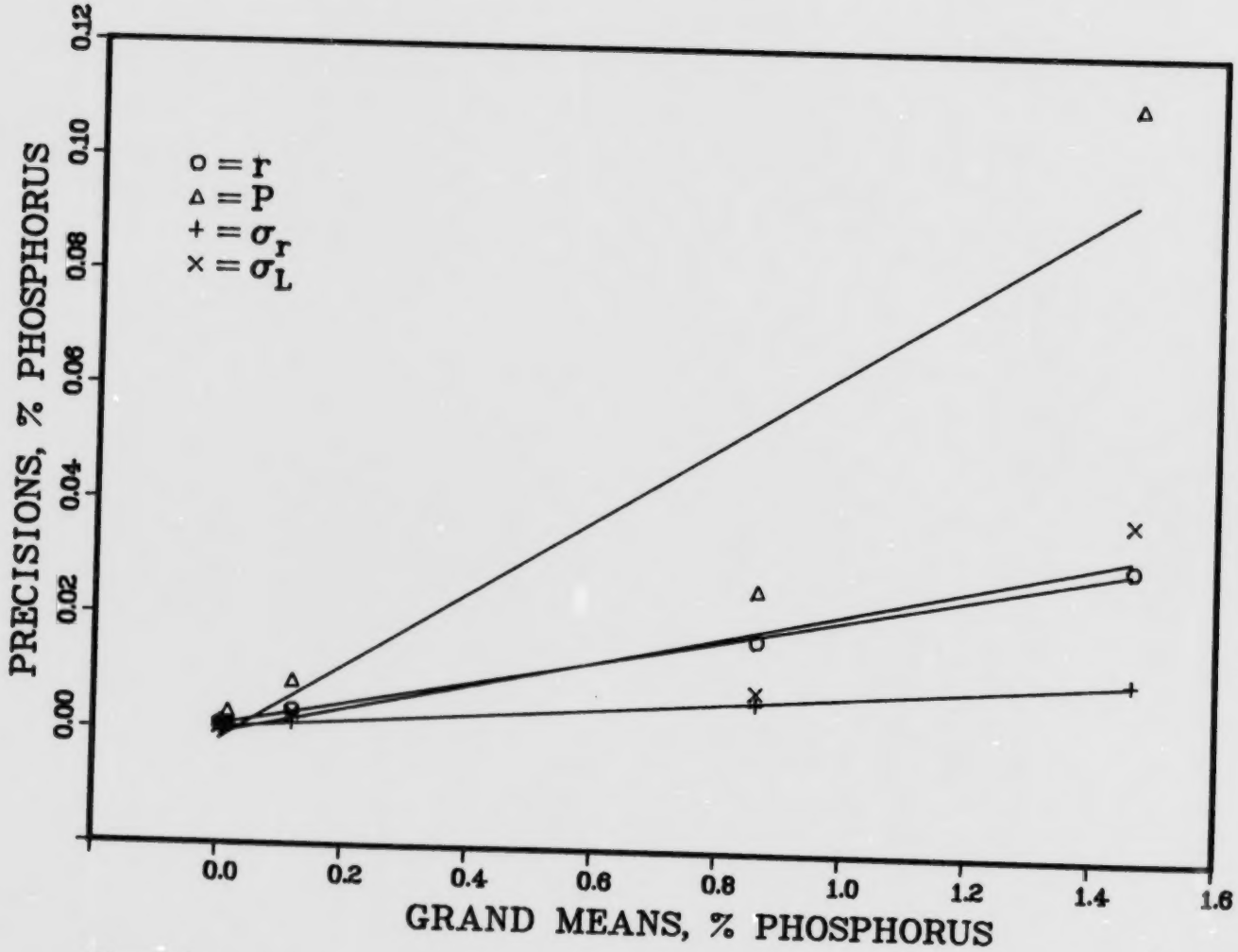

Figure 3.A
ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD

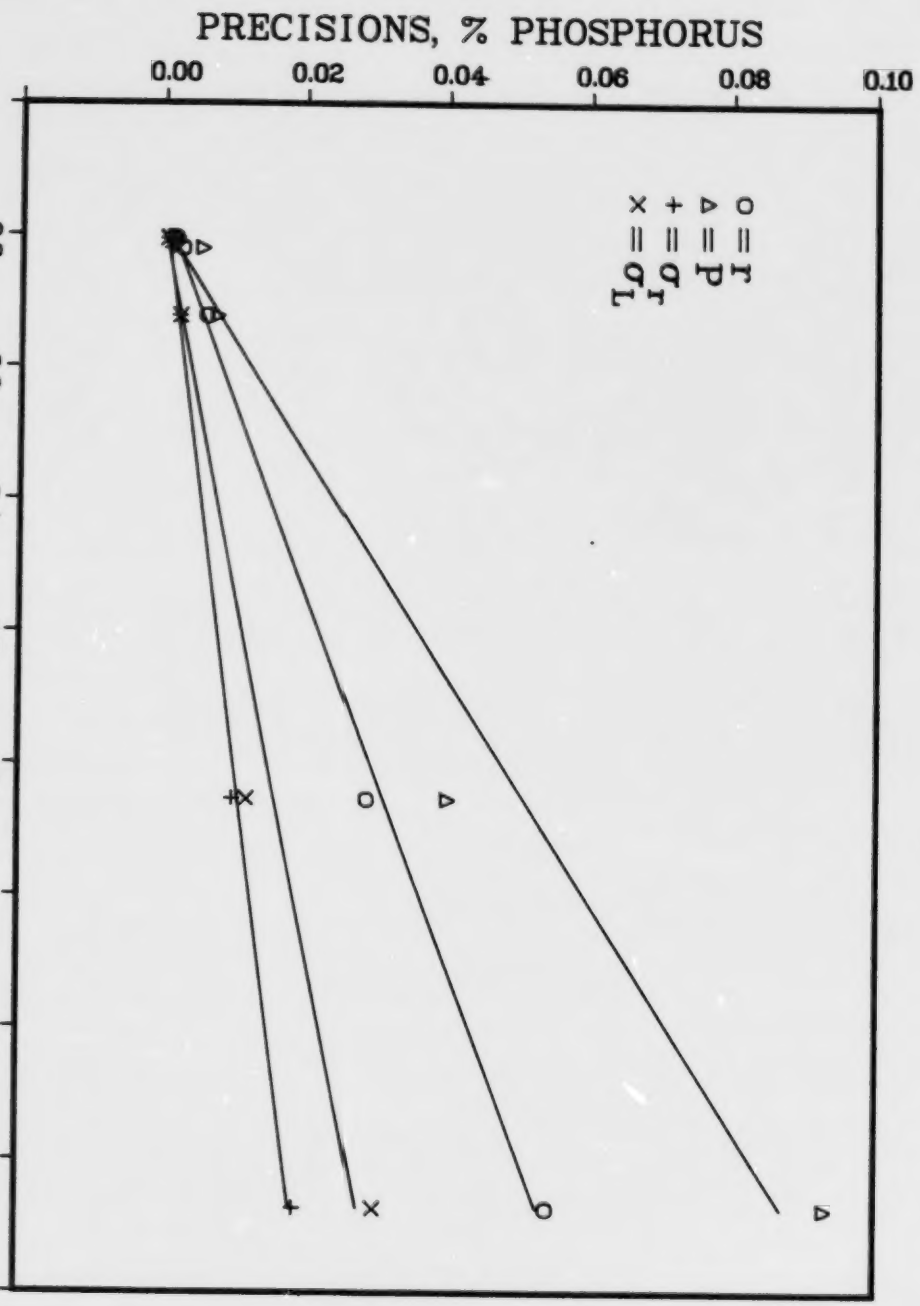

Figure 3.B
ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD

ISO/TC 102/SC 2/WG 25B & WG 28A
DETERMINATION OF PHOSPHORUS CONTENT IN IRON ORES BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHODS

STATISTICAL ANALYSIS OF INTERNATIONAL TEST DATA - 1986

Appendix A.1

Detailed Computation of the Analytical Data Obtained by WG 25B

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0040	.0037	.00385	.9667E-07
		2	.0035	.0042		
2	AU 2	1	.0043	.0046	.00443	.2250E-07
		2	.0043	.0045		
3	AU 3	1	.0038	.0039	.00390	.6667E-08
		2	.0040	.0039		
4	AU 4	1	.0044	.0041	.00420	.3333E-07
		2	.0043	.0040		
5	AU 5	1	.0045	.0037	.00433	.1758E-06
		2	.0045	.0046		
6	BR 1	1	.0040	.0040	.00375	.8333E-07
		2	.0035	.0035		
7	BR 2	1	.0040	.0040	.00408	.1425E-06
		2	.0046	.0037		
8	BR 3	1	.0038	.0038	.00380	.0000E+00
		2	.0038	.0038		
9	CA 1	1	.0039	.0036	.00373	.1583E-07
		2	.0037	.0037		
10	CA 2	1	.0042	.0046	.00465	.4367E-06
		2	.0042	.0056		
11	CA 3	1	.0049	.0042	.00443	.1025E-06
		2	.0043	.0043		
12	DE 1	1	.0044	.0046	.00473	.7583E-07
		2	.0049	.0050		
13	DE 2	1	.0046	.0044	.00463	.4250E-07
		2	.0046	.0049		
14	DE 3	1	.0060	.0053	.00538	.1892E-06
		2	.0050	.0052		
15	DE 4	1	.0040	.0040	.00403	.2500E-08
		2	.0041	.0040		
16	FR 1	1	.0046	.0042	.00435	.3000E-07
		2	.0043	.0043		
17	IT 1	1	.0045	.0035	.00375	.4167E-06
		2	.0030	.0040		
18	IT 2	1	.0050	.0060	.00525	.2500E-06
		2	.0050	.0050		
19	IT 3	1	.0035	.0040	.00388	.2292E-06
		2	.0045	.0035		
20	JP 1	1	.0042	.0043	.00418	.9167E-08
		2	.0041	.0041		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	JP 2	1	.0040	.0039	.00395	.3333E-08
		2	.0039	.0040		
22	JP 3	1	.0041	.0041	.00410	.0000E+00
		2	.0041	.0041		
23	NL 1	1	.0041	.0042	.00420	.6667E-08
		2	.0043	.0042		
24	SE 1	1	.0036	.0050	.00433	.3425E-06
		2	.0042	.0045		
25	SE 2	1	.0044	.0050	.00460	.8000E-07
		2	.0046	.0044		
26	SU 1	1	.0042	.0043	.00433	.9167E-08
		2	.0044	.0044		
27	US 1	1	.0042	.0043	.00420	.4667E-07
		2	.0039	.0044		
28	ZA 1	1	.0042	.0035	.00385	.8333E-07
		2	.0039	.0038		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	33.319
CHI-SQUARE(.95,33)	47.407

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

DE 3	BOTTLE- 1	T-CALC = 3.565	T-CRIT(.00089,54) = 3.517
IT 2	BOTTLE- 1	T-CALC = 3.590	T-CRIT(.00091,53) = 3.515

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

BR 1	ZERO WITHIN-BOTTLE VARIANCE
BR 2	ZERO WITHIN-BOTTLE VARIANCE
BR 3	ZERO WITHIN-BOTTLE VARIANCE
CA 1	ZERO WITHIN-BOTTLE VARIANCE
CA 3	ZERO WITHIN-BOTTLE VARIANCE
DE 3	DOORNBOS' TEST FOR BOTTLE MEANS
DE 4	ZERO WITHIN-BOTTLE VARIANCE
FR 1	ZERO WITHIN-BOTTLE VARIANCE
IT 2	DOORNBOS' TEST FOR BOTTLE MEANS
JP 1	ZERO WITHIN-BOTTLE VARIANCE
JP 3	ZERO WITHIN-BOTTLE VARIANCE
SU 1	ZERO WITHIN-BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	15	.64093750E-05	.42729167E-06
BETWEEN BOTTLES	16	.11150000E-05	.69687500E-07
WITHIN BOTTLES	32	.51800000E-05	.16187500E-06
TOTAL	63	.12704375E-04	

F-CALC = .431 F-CRIT(.95;16,32) = 1.972

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	56.777
CHI-SQUARE(.95,25)	37.660

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

NONE REJECTED

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

ALL RESULTS WERE USED EXCEPT INDIVIDUAL REPLICATES LISTED BELOW

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	27	.19078125E-04	.70659722E-06
WITHIN LABS	84	.87975000E-05	.10473214E-06
TOTAL	111	.27875625E-04	

REPEATABILITY VARIANCE	.10473214E-06
REPEATABILITY STD. DEV.	.00032362
BETWEEN-LABORATORIES VARIANCE	.15046627E-06
BETWEEN-LABORATORIES STD. DEV.	.00038790
REPEATABILITY	.00091585
PERMISSIBLE TOLERANCE BETWEEN LABS	.00127454
GRAND MEAN	.00424375
VARIANCE OF THE GRAND MEAN	.63089038E-08

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0064	.0062	.00623	.1583E-07
		2	.0061	.0062		
2	AU 2	1	.0064	.0061	.00628	.2250E-07
		2	.0064	.0062		
3	AU 3	1	.0064	.0060	.00620	.5333E-07
		2	.0064	.0060		
4	AU 4	1	.0061	.0060	.00605	.3333E-08
		2	.0061	.0060		
5	AU 5	1	.0066	.0102	.00728	.3983E-05
		2	.0066	.0057		
6	BR 1	1	.0055	.0055	.00550	.0000E+00
		2	.0055	.0055		
7	BR 2	1	.0067	.0068	.00655	.2567E-06
		2	.0058	.0069		
8	BR 3	1	.0057	.0056	.00573	.1583E-07
		2	.0057	.0059		
9	CA 1	1	.0059	.0060	.00595	.1667E-07
		2	.0058	.0061		
10	CA 2	1	.0061	.0067	.00650	.1800E-06
		2	.0062	.0070		
11	CA 3	1	.0060	.0060	.00613	.2250E-07
		2	.0062	.0063		
12	DE 1	1	.0057	.0063	.00630	.1867E-06
		2	.0065	.0067		
13	DE 2	1	.0061	.0063	.00630	.2667E-07
		2	.0063	.0065		
14	DE 3	1	.0072	.0070	.00705	.1167E-06
		2	.0066	.0074		
15	DE 4	1	.0060	.0058	.00598	.5583E-07
		2	.0063	.0058		
16	FR 1	1	.0060	.0058	.00600	.2667E-07
		2	.0062	.0060		
17	IT 1	1	.0045	.0050	.00500	.1667E-06
		2	.0055	.0050		
18	IT 2	1	.0070	.0060	.00650	.3333E-06
		2	.0060	.0070		
19	IT 3	1	.0045	.0055	.00500	.1667E-06
		2	.0050	.0050		
20	JP 1	1	.0061	.0057	.00593	.4250E-07
		2	.0061	.0058		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	JP 2	1	.0058	.0060	.00593	.9167E-08
		2	.0059	.0060		
22	JP 3	1	.0060	.0059	.00595	.3333E-08
		2	.0059	.0060		
23	NL 1	1	.0058	.0059	.00583	.2500E-08
		2	.0058	.0058		
24	SE 1	1	.0057	.0058	.00580	.1400E-06
		2	.0054	.0063		
25	SE 2	1	.0060	.0058	.00590	.8133E-06
		2	.0070	.0048		
26	SU 1	1	.0065	.0065	.00640	.7333E-07
		2	.0066	.0060		
27	US 1	1	.0063	.0061	.00625	.1667E-07
		2	.0062	.0064		
28	ZA 1	1	.0066	.0054	.00570	.4200E-06
		2	.0057	.0051		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	64.005
CHI-SQUARE(.95,45)	61.652

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR BOTTLE VARIANCE (ALPHA=.05)

AU 5	BOTTLE- 1	C-CALC = .453	C-CRIT(2,46) = .213
SE 2	BOTTLE- 2	C-CALC = .310	C-CRIT(2,45) = .217

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

AU 5	BOTTLE- 1	T-CALC = 5.266	T-CRIT(.00089,54) = 3.517

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

AU 5	DOORNBOS' TEST FOR BOTTLE MEANS
BR 1	ZERO WITHIN-BOTTLE VARIANCE
CA 3	ZERO WITHIN-BOTTLE VARIANCE
IT 3	ZERO WITHIN-BOTTLE VARIANCE
NL 1	ZERO WITHIN-BOTTLE VARIANCE
SE 2	COCHRAN'S TEST FOR BOTTLE VARIANCE
SU 1	ZERO WITHIN-BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	20	.13274524E-04	.66372619E-06
BETWEEN BOTTLES	21	.13550000E-05	.64523810E-07
WITHIN BOTTLES	42	.49700000E-05	.11833333E-06
TOTAL	83	.19599524E-04	

F-CALC = .545 F-CRIT(.95;21,42) = 1.813

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	114.151
CHI-SQUARE(.95,26)	38.894

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

AU 5	C-CALC = .556	C-CRIT(4,27) = .174
SE 2	C-CALC = .255	C-CRIT(4,26) = .179

DIXON'S TEST FOR LABORATORY MEANS (ALPHA= 05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

AU 5	COCHRAN'S TEST FOR LABORATORY VARIANCE
SE 2	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	25	.19826154E-04	.79304615E-06
WITHIN LABS	78	.71200000E-05	.91282051E-07
TOTAL	103	.26946154E-04	

REPEATABILITY VARIANCE	.91282051E-07
REPEATABILITY STD. DEV.	.00030213
BETWEEN-LABORATORIES VARIANCE	.17544103E-06
BETWEEN-LABORATORIES STD. DEV.	.00041886
REPEATABILITY	.00085503
PERMISSIBLE TOLERANCE BETWEEN LABS	.00133065
GRAND MEAN	.00603846
VARIANCE OF THE GRAND MEAN	.76254438E-08

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.0164	.0171	.01683	.1158E-06
		2	.0167	.0171		
2	AU 2	1	.0174	.0170	.01730	.4000E-07
		2	.0174	.0174		
3	AU 3	1	.0154	.0155	.01560	.3333E-07
		2	.0158	.0157		
4	AU 4	1	.0172	.0172	.01720	.6667E-08
		2	.0173	.0171		
5	AU 5	1	.0174	.0169	.01745	.1203E-05
		2	.0190	.0165		
6	BR 1	1	.0158	.0165	.01633	.1225E-06
		2	.0165	.0165		
7	BR 2	1	.0176	.0170	.01735	.1700E-06
		2	.0170	.0178		
8	BR 3	1	.0156	.0163	.01583	.1092E-06
		2	.0156	.0158		
9	CA 1	1	.0163	.0162	.01643	.4917E-07
		2	.0165	.0167		
10	CA 2	1	.0168	.0208	.01928	.8769E-05
		2	.0168	.0227		
11	CA 3	1	.0179	.0181	.01850	.4000E-06
		2	.0193	.0187		
12	DE 1	1	.0195	.0202	.02040	.5000E-06
		2	.0208	.0211		
13	DE 2	1	.0180	.0182	.01830	.6667E-07
		2	.0186	.0184		
14	DE 3	1	.0172	.0177	.01730	.8667E-07
		2	.0170	.0173		
15	DE 4	1	.0182	.0181	.01820	.4667E-07
		2	.0185	.0180		
16	FR 1	1	.0163	.0164	.01628	.3583E-07
		2	.0160	.0164		
17	IT 1	1	.0160	.0165	.01650	.1667E-06
		2	.0170	.0165		
18	IT 2	1	.0170	.0172	.01720	.2667E-07
		2	.0172	.0174		
19	IT 3	1	.0175	.0185	.01788	.2292E-06
		2	.0180	.0175		
20	JP 1	1	.0164	.0160	.01640	.1400E-06
		2	.0169	.0163		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	JP 2	1	.0159	.0165	.01633	.8250E-07
		2	.0164	.0165		
22	JP 3	1	.0164	.0162	.01628	.9167E-08
		2	.0163	.0162		
23	NL 1	1	.0167	.0160	.01645	.1367E-06
		2	.0163	.0168		
24	SE 1	1	.0151	.0192	.01768	.3836E-05
		2	.0172	.0192		
25	SE 2	1	.0180	.0160	.01640	.1173E-05
		2	.0156	.0160		
26	SU 1	1	.0167	.0168	.01685	.3000E-07
		2	.0168	.0171		
27	US 1	1	.0185	.0180	.01845	.1367E-06
		2	.0189	.0184		
28	ZA 1	1	.0164	.0165	.01663	.4917E-07
		2	.0167	.0169		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	90.120
CHI-SQUARE(.95,49)	66.334

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR BOTTLE VARIANCE (ALPHA=.05)

CA 2	BOTTLE- 2	C-CALC = .385	C-CRIT(2,50) = .200
SE 1	BOTTLE- 1	C-CALC = .302	C-CRIT(2,49) = .203
CA 2	BOTTLE- 1	C-CALC = .411	C-CRIT(2,48) = .206
AU 5	BOTTLE- 2	C-CALC = .273	C-CRIT(2,47) = .210
SE 1	BOTTLE- 2	C-CALC = .240	C-CRIT(2,46) = .213
SE 2	BOTTLE- 1	C-CALC = .316	C-CRIT(2,45) = .217

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

DE 1	BOTTLE- 2	T-CALC = 3.800	T-CRIT(.00089,54) = 3.517

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

AU 2	ZERO WITHIN-BOTTLE VARIANCE
AU 4	ZERO WITHIN-BOTTLE VARIANCE
AU 5	COCHRAN'S TEST FOR BOTTLE VARIANCE
BR 1	ZERO WITHIN-BOTTLE VARIANCE
CA 2	COCHRAN'S TEST FOR BOTTLE VARIANCE
DE 1	DOORNBOS' TEST FOR BOTTLE MEANS
SE 1	COCHRAN'S TEST FOR BOTTLE VARIANCE
SE 2	COCHRAN'S TEST FOR BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	19	.59099500E-04	.31105000E-05
BETWEEN BOTTLES	20	.25300000E-05	.12650000E-06
WITHIN BOTTLES	40	.38300000E-05	.95750000E-07
TOTAL	79	.65459500E-04	

F-CALC = 1.321 F-CRIT(.95;20,40) = 1.839

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC 123.741
CHI-SQUARE(.95,27) 40.119

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

CA 2	C-CALC = .493	C-CRIT(4,28) = .168
SE 1	C-CALC = .426	C-CRIT(4,27) = .174
AU 5	C-CALC = .233	C-CRIT(4,26) = .179
SE 2	C-CALC = .296	C-CRIT(4,25) = .185

BOTTLE- 1 REPLICATE- 1 DIXON'S TEST WITHIN SE 2
R10 = .833 D-CRIT(4) = .828

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

AU 5	COCHRAN'S TEST FOR LABORATORY VARIANCE
CA 2	COCHRAN'S TEST FOR LABORATORY VARIANCE
SE 1	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

SE 2	BOTTLE- 1	REPLICATE- 1	.0180

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	24	.11097694E-03	.46240394E-05
WITHIN LABS	74	.84741667E-05	.11451577E-06
TOTAL	98	.11945111E-03	

REPEATABILITY VARIANCE	.11451577E-06
REPEATABILITY STD. DEV.	.00033840
BETWEEN-LABORATORIES VARIANCE	.11388848E-05
BETWEEN-LABORATORIES STD. DEV.	.00106719
REPEATABILITY	.00095768
PERMISSIBLE TOLERANCE BETWEEN LABS	.00309512
GRAND MEAN	.01707778
VARIANCE OF THE GRAND MEAN	.46823669E-07

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.1201	.1200	.11985	.7000E-07
		2	.1198	.1195		
2	AU 2	1	.1222	.1220	.12223	.6917E-07
		2	.1221	.1226		
3	AU 3	1	.1187	.1183	.11868	.8250E-07
		2	.1190	.1187		
4	AU 4	1	.1207	.1202	.12033	.8917E-07
		2	.1200	.1204		
5	AU 5	1	.1138	.1182	.11720	.5813E-05
		2	.1194	.1174		
6	BR 1	1	.1120	.1130	.11250	.3333E-06
		2	.1120	.1130		
7	BR 2	1	.1172	.1235	.11940	.1035E-04
		2	.1204	.1165		
8	BR 3	1	.1120	.1120	.11235	.2233E-06
		2	.1130	.1124		
9	CA 1	1	.1224	.1219	.12180	.2467E-06
		2	.1217	.1212		
10	CA 2	1	.1232	.1238	.12298	.4425E-06
		2	.1223	.1226		
11	CA 3	1	.1195	.1200	.12045	.7100E-06
		2	.1213	.1210		
12	DE 1	1	.1210	.1230	.12450	.9667E-05
		2	.1260	.1280		
13	DE 2	1	.1231	.1231	.12333	.6917E-07
		2	.1235	.1236		
14	DE 3	1	.1194	.1205	.11995	.2833E-06
		2	.1196	.1203		
15	DE 4	1	.1210	.1212	.12135	.1967E-06
		2	.1220	.1212		
16	FR 1	1	.1220	.1220	.12218	.1225E-06
		2	.1220	.1227		
17	IT 1	1	.1200	.1160	.11825	.2917E-05
		2	.1180	.1190		
18	IT 2	1	.1162	.1180	.11653	.1116E-05
		2	.1155	.1164		
19	IT 3	1	.1150	.1180	.11725	.2917E-05
		2	.1170	.1190		
20	JP 1	1	.1229	.1216	.12230	.1327E-05
		2	.1236	.1211		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	JP 2	1	.1197	.1222	.12070	.2727E-05
		2	.1189	.1220		
22	JP 3	1	.1200	.1199	.12010	.3333E-07
		2	.1202	.1203		
23	NL 1	1	.1204	.1198	.12003	.2025E-06
		2	.1204	.1195		
24	SE 1	1	.1171	.1214	.11935	.6177E-05
		2	.1173	.1216		
25	SE 2	1	.1095	.1175	.11913	.8790E-04
		2	.1175	.1320		
26	SU 1	1	.1267	.1224	.12295	.6777E-05
		2	.1220	.1207		
27	US 1	1	.1255	.1241	.12403	.4209E-05
		2	.1211	.1254		
28	ZA 1	1	.1196	.1209	.11990	.5800E-06
		2	.1191	.1200		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	81.703
CHI-SQUARE(.95,49)	66.334

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR BOTTLE VARIANCE (ALPHA=.05)

SE 2	BOTTLE- 2	C-CALC = .415	C-CRIT(2,50) = .200
SE 2	BOTTLE- 1	C-CALC = .216	C-CRIT(2,49) = .203

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

BR 3	ZERO WITHIN-BOTTLE VARIANCE
DE 2	ZERO WITHIN-BOTTLE VARIANCE
FR 1	ZERO WITHIN-BOTTLE VARIANCE
SE 2	COCHRAN'S TEST FOR BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	23	.63681240E-03	.27687495E-04
BETWEEN BOTTLES	24	.55947500E-04	.23311458E-05
WITHIN BOTTLES	48	.11606500E-03	.24180208E-05
TOTAL	95	.80882490E-03	

F-CALC = .964 F-CRIT(.95;24,48) = 1.746

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	148.566
CHI-SQUARE(.95,27)	40.119

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

SE 2	C-CALC = .603	C-CRIT(4,28) = .168
BR 2	C-CALC = .179	C-CRIT(4,27) = .174
DE 1	C-CALC = .204	C-CRIT(4,26) = .179

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

BR 2	COCHRAN'S TEST FOR LABORATORY VARIANCE
DE 1	COCHRAN'S TEST FOR LABORATORY VARIANCE
SE 2	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	24	.85078040E-03	.35449183E-04
WITHIN LABS	75	.11319750E-03	.15093000E-05
TOTAL	99	.96397790E-03	

REPEATABILITY VARIANCE	.15093000E-05
REPEATABILITY STD. DEV.	.00122854
BETWEEN-LABORATORIES VARIANCE	.84849708E-05
BETWEEN-LABORATORIES STD. DEV.	.00291290
REPEATABILITY	.00347676
PERMISSIBLE TOLERANCE BETWEEN LABS	.00860228
GRAND MEAN	.11986100
VARIANCE OF THE GRAND MEAN	.35449183E-06

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
1	AU 1	1	.8502	.8564	.85330	.7533E-05
		2	.8546	.8520		
2	AU 2	1	.8720	.8790	.87500	.1267E-04
		2	.8720	.8770		
3	AU 3	1	.8400	.8420	.84100	.6667E-05
		2	.8440	.8380		
4	AU 4	1	.8630	.8650	.86600	.8667E-05
		2	.8700	.8660		
5	AU 5	1	.8210	.8360	.83175	.1056E-03
		2	.8440	.8260		
6	BR 1	1	.8000	.8150	.80750	.7500E-04
		2	.8000	.8150		
7	BR 2	1	.8750	.8840	.87225	.9425E-04
		2	.8610	.8690		
8	BR 3	1	.7910	.7900	.79100	.6667E-06
		2	.7910	.7920		
9	CA 1	1	.8590	.8560	.86025	.1158E-04
		2	.8630	.8630		
10	CA 2	1	.8700	.8790	.87525	.2025E-04
		2	.8730	.8790		
11	CA 3	1	.8605	.8697	.86128	.3730E-04
		2	.8598	.8551		
12	DE 1	1	.8470	.8500	.85175	.2158E-04
		2	.8520	.8580		
13	DE 2	1	.8760	.8700	.86975	.2425E-04
		2	.8640	.8690		
14	DE 3	1	.8520	.8540	.85725	.2492E-04
		2	.8610	.8620		
15	DE 4	1	.8860	.8630	.87050	.1110E-03
		2	.8680	.8650		
16	FR 1	1	.8630	.8710	.87300	.5933E-04
		2	.8780	.8800		
17	IT 1	1	.8700	.8570	.86175	.4892E-04
		2	.8650	.8550		
18	IT 2	1	.8600	.8600	.85875	.2250E-05
		2	.8570	.8580		
19	IT 3	1	.8600	.8700	.86425	.6558E-04
		2	.8550	.8720		
20	JP 1	1	.8740	.8610	.86900	.5133E-04
		2	.8760	.8650		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	JP 2	1	.8560	.8750	.86250	.1003E-03
		2	.8530	.8660		
22	JP 3	1	.8570	.8490	.85250	.1167E-04
		2	.8510	.8530		
23	NL 1	1	.8570	.8570	.85700	.2667E-05
		2	.8590	.8550		
24	SE 1	1	.8700	.8560	.86400	.5067E-04
		2	.8700	.8600		
25	SE 2	1	.9000	.8750	.88000	.2167E-03
		2	.8800	.8650		
26	SU 1	1	.8730	.8680	.86800	.2067E-04
		2	.8690	.8620		
27	US 1	1	.8750	.8890	.87600	.8667E-04
		2	.8670	.8730		
28	ZA 1	1	.8610	.8630	.86300	.4667E-05
		2	.8660	.8620		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	36.402
CHI-SQUARE(.95,49)	66.334

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

BR 3	BOTTLE- 1	T-CALC = 3.832	T-CRIT(.00089,54) = 3.517
BR 3	BOTTLE- 2	T-CALC = 4.472	T-CRIT(.00091,53) = 3.515
BR 1	BOTTLE- 2	T-CALC = 3.960	T-CRIT(.00093,52) = 3.513
BR 1	BOTTLE- 1	T-CALC = 4.822	T-CRIT(.00094,51) = 3.511

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

BR 1	DOORNBOS' TEST FOR BOTTLE MEANS
BR 3	DOORNBOS' TEST FOR BOTTLE MEANS
CA 1	ZERO WITHIN-BOTTLE VARIANCE
IT 2	ZERO WITHIN-BOTTLE VARIANCE
NL 1	ZERO WITHIN-BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	22	.11747609E-01	.53398224E-03
BETWEEN BOTTLES	23	.11575225E-02	.50327065E-04
WITHIN BOTTLES	46	.24159650E-02	.52520978E-04
TOTAL	91	.15321097E-01	

F-CALC = .958 F-CRIT(.95;23,46) = 1.767

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	50.631
CHI-SQUARE(.95,27)	40.119

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

SE 2 C-CALC = .169 C-CRIT(4,28) = .168

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

BR 3	R =	.484	D-CRIT(28) =	.423
BR 1	R =	.494	D-CRIT(27) =	.430
AU 5	R =	.460	D-CRIT(26) =	.436

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

AU 5	DIXON'S TEST FOR LABORATORY MEANS
BR 1	DIXON'S TEST FOR LABORATORY MEANS
BR 3	DIXON'S TEST FOR LABORATORY MEANS
SE 2	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	23	.69281366E-02	.30122333E-03
WITHIN LABS	72	.26562375E-02	.36892187E-04
TOTAL	95	.95843741E-02	

REPEATABILITY VARIANCE	.36892187E-04
REPEATABILITY STD. DEV.	.00607389
BETWEEN-LABORATORIES VARIANCE	.66082785E-04
BETWEEN-LABORATORIES STD. DEV.	.00812913
REPEATABILITY	.01718912
PERMISSIBLE TOLERANCE BETWEEN LABS	.02601890
GRAND MEAN	.86347188
VARIANCE OF THE GRAND MEAN	.31377430E-05

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
1	AU 1	1	1.4830	1.4680	1.49075	.3582E-03
		2	1.5020	1.5100		
2	AU 2	1	1.4830	1.5030	1.49450	.1123E-03
		2	1.4880	1.5040		
3	AU 3	1	1.4530	1.4510	1.44925	.1492E-04
		2	1.4440	1.4490		
4	AU 4	1	1.4850	1.4740	1.48125	.3492E-04
		2	1.4870	1.4790		
5	AU 5	1	1.4180	1.4220	1.43050	.2303E-03
		2	1.4520	1.4300		
6	BR 1	1	1.3950	1.3950	1.40375	.3062E-03
		2	1.3950	1.4300		
7	BR 2	1	1.5050	1.4660	1.48825	.3942E-03
		2	1.5050	1.4770		
8	BR 3	1	1.3800	1.3840	1.38400	.8000E-05
		2	1.3860	1.3860		
9	CA 1	1	1.4830	1.4810	1.48350	.3667E-05
		2	1.4850	1.4850		
10	CA 2	1	1.5230	1.5080	1.50850	.1163E-03
		2	1.5060	1.4970		
11	CA 3	1	1.4674	1.4768	1.47665	.4233E-04
		2	1.4812	1.4812		
12	DE 1	1	1.4360	1.4400	1.44425	.5892E-04
		2	1.4480	1.4530		
13	DE 2	1	1.4960	1.4890	1.48875	.2758E-04
		2	1.4860	1.4840		
14	DE 3	1	1.4700	1.4740	1.47500	.2533E-04
		2	1.4820	1.4740		
15	DE 4	1	1.4840	1.4780	1.48075	.1025E-04
		2	1.4780	1.4830		
16	FR 1	1	1.4910	1.4860	1.49200	.2467E-04
		2	1.4980	1.4930		
17	IT 1	1	1.4000	1.3900	1.39625	.1229E-03
		2	1.4100	1.3850		
18	IT 2	1	1.4050	1.4100	1.40500	.5000E-04
		2	1.4100	1.3950		
19	IT 3	1	1.3850	1.3900	1.38875	.7292E-04
		2	1.4000	1.3800		
20	JP 1	1	1.5110	1.4820	1.49475	.2249E-03
		2	1.5040	1.4820		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	JP 2	1	1.4890	1.4910	1.49250	.9667E-05
		2	1.4940	1.4960		
22	JP 3	1	1.4630	1.4570	1.46025	.6250E-05
		2	1.4610	1.4600		
23	NL 1	1	1.4780	1.4700	1.47025	.3092E-04
		2	1.4680	1.4650		
24	SE 1	1	1.5080	1.4620	1.48800	.4953E-03
		2	1.5050	1.4770		
25	SE 2	1	1.5040	1.4950	1.51050	.3563E-03
		2	1.5380	1.5050		
26	SU 1	1	1.4720	1.4910	1.48100	.7400E-04
		2	1.4760	1.4850		
27	US 1	1	1.5240	1.5330	1.52575	.4025E-04
		2	1.5280	1.5180		
28	ZA 1	1	1.4720	1.4710	1.47650	.3367E-04
		2	1.4820	1.4810		

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	50.006
CHI-SQUARE(.95,47)	63.997

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

BR 1	ZERO WITHIN-BOTTLE VARIANCE
BR 3	ZERO WITHIN-BOTTLE VARIANCE
CA 1	ZERO WITHIN-BOTTLE VARIANCE
CA 3	ZERO WITHIN-BOTTLE VARIANCE

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	23	.11708699E+00	.50907387E-02
BETWEEN BOTTLES	24	.27292500E-02	.11371875E-03
WITHIN BOTTLES	48	.60465000E-02	.12596875E-03
TOTAL	95	.12586274E+00	

F-CALC = .903 F-CRIT(.95;24,48) = 1.746

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	58.721
CHI-SQUARE(.95,27)	40.119

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

NONE REJECTED

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

ALL RESULTS WERE USED EXCEPT INDIVIDUAL REPLICATES LISTED BELOW

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 25B PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	27	.16392149E+00	.60711662E-02
WITHIN LABS	84	.98564900E-02	.11733917E-03
TOTAL	111	.17377798E+00	

REPEATABILITY VARIANCE	.11733917E-03
REPEATABILITY STD. DEV.	.01083232
BETWEEN-LABORATORIES VARIANCE	.14884568E-02
BETWEEN-LABORATORIES STD. DEV.	.03858052
REPEATABILITY	.03065547
PERMISSIBLE TOLERANCE BETWEEN LABS	.11131388
GRAND MEAN	1.46646964
VARIANCE OF THE GRAND MEAN	.54206841E-04

ISO/TC 102/SC 2/WG 25B & WG 28A
DETERMINATION OF PHOSPHORUS CONTENT IN IRON ORES BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHODS

STATISTICAL ANALYSIS OF INTERNATIONAL TEST DATA - 1986

Appendix A.2

Detailed Computation of the Analytical Data Obtained by WG 28A

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS			LAB MEAN	LAB VARIANCE
1	AU 1A	1	.0047	.0044		.00480	.1000E-06
		2	.0050	.0051			
2	AU 1B	1	.0046	.0047		.00485	.5667E-07
		2	.0051	.0050			
3	AU 2A	1	.0050	.0048		.00483	.1583E-07
		2	.0048	.0047			
4	AU 2B	1	.0048			.00470	.2000E-07
		2	.0046				
5	AU 3A	1	.0060	.0058	.0043	.00455	.8086E-06
			.0047				
		2	.0037	.0038	.0038		
			.0043				
6	AU 3B	1	.0042	.0043	.0038	.00430	.4400E-06
			.0043				
		2	.0050	.0055	.0038		
			.0035				
7	BR 1	1	.0042	.0042		.00420	.0000E+00
		2	.0042	.0042			
8	BR 2	1	.0045	.0043		.00458	.1825E-06
		2	.0043	.0052			
9	BR 3	1	.0040	.0039		.00390	.2000E-07
		2	.0037	.0040			
10	CA 1	1	.0048	.0063		.00480	.1207E-05
		2	.0037	.0044			
11	CA 2	1	.0039	.0039		.00390	.0000E+00
		2	.0039	.0039			
12	CA 3	1	.0053	.0063		.00543	.7292E-06
		2	.0043	.0058			
13	CA 4	1	.0042	.0042		.00430	.2000E-07
		2	.0043	.0045			
14	ZA 1	1	.0062	.0061		.00573	.2692E-06
		2	.0055	.0051			
15	SE 2	1	.0047	.0047		.00460	.1800E-06
		2	.0050	.0040			
16	SE 3	1	.0036	.0038		.00365	.1000E-07
		2	.0036	.0036			
17	SU 1	1	.0045	.0041		.00428	.4250E-07
		2	.0044	.0041			
18	SU 1A	1	.0038	.0049		.00433	.3092E-06
		2	.0039	.0047			
19	SU 2	1	.0041	.0032		.00370	.2733E-06
		2	.0042	.0033			
20	SU 3	1	.0033	.0035		.00350	.2000E-07
		2	.0036	.0036			

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	US 1	1	.0039	.0049	.00440	.5000E-06

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	22.016
CHI-SQUARE(.95,21)	32.678

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

AU 2B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3A	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
BR 1	ZERO WITHIN-BOTTLE VARIANCE
CA 2	ZERO WITHIN-BOTTLE VARIANCE
CA 4	ZERO WITHIN-BOTTLE VARIANCE
SE 2	ZERO WITHIN-BOTTLE VARIANCE
SE 3	ZERO WITHIN-BOTTLE VARIANCE
SU 3	ZERO WITHIN-BOTTLE VARIANCE
US 1	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	10	.14354091E-04	.14354091E-05
BETWEEN BOTTLES	11	.41150000E-05	.37409091E-06
WITHIN BOTTLES	22	.55000000E-05	.25000000E-06
TOTAL	43	.23969091E-04	

F-CALC = 1.496 F-CRIT(.95;11,22) = 2.259

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	44.870
CHI-SQUARE(.95,18)	28.877

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

CA 1 C-CALC = .232 C-CRIT(4,19) = .230

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

CA 1 COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-3

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	19	.23824524E-04	.12539223E-05
WITHIN LABS	64	.15945000E-04	.24914062E-06
TOTAL	83	.39769524E-04	

REPEATABILITY VARIANCE	.24914062E-06
REPEATABILITY STD. DEV.	.00049914
BETWEEN-LABORATORIES VARIANCE	.24064099E-06
BETWEEN-LABORATORIES STD. DEV.	.00049055
REPEATABILITY	.00141257
PERMISSIBLE TOLERANCE BETWEEN LABS	.00171025
GRAND MEAN	.00441905
VARIANCE OF THE GRAND MEAN	.16334904E-07

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS			LAB MEAN	LAB VARIANCE
1	AU 1A	1	.0061	.0064		.00630	.2000E-07
		2	.0064	.0063			
2	AU 1B	1	.0071	.0067		.00650	.2467E-06
		2	.0062	.0060			
3	AU 2A	1	.0064	.0067		.00643	.4250E-07
		2	.0064	.0062			
4	AU 2B	1	.0065			.00630	.8000E-07
		2	.0061				
5	AU 3A	1	.0067	.0067	.0062	.00614	.2141E-06
			.0055				
		2	.0060	.0063	.0062		
			.0055				
6	AU 3B	1	.0043	.0058	.0060	.00524	.4998E-06
			.0055				
		2	.0042	.0048	.0055		
			.0058				
7	BR 1	1	.0058	.0063		.00593	.6250E-07
		2	.0058	.0058			
8	BR 2	1	.0061	.0058		.00618	.1892E-06
		2	.0060	.0068			
9	BR 3	1	.0055	.0060		.00573	.6917E-07
		2	.0059	.0055			
10	CA 1	1	.0068	.0080		.00650	.1347E-05
		2	.0054	.0058			
11	CA 2	1	.0052	.0056		.00553	.6250E-07
		2	.0058	.0055			
12	CA 3	1	.0066	.0104		.00898	.2709E-05
		2	.0095	.0094			
13	CA 4	1	.0067	.0065		.00675	.2767E-06
		2	.0075	.0063			
14	BR 1	1	.0068	.0064		.00678	.6917E-07
		2	.0070	.0069			
15	SE 2	1	.0060	.0053		.00608	.4892E-06
		2	.0060	.0070			
16	SE 3	1	.0041	.0058		.00543	.1449E-05
		2	.0049	.0069			
17	SU 1	1	.0064	.0059		.00618	.4250E-07
		2	.0062	.0062			
18	SU 1A	1	.0058	.0063		.00620	.1133E-06
		2	.0061	.0066			
19	SU 2	1	.0085	.0065		.00688	.1229E-05
		2	.0065	.0060			
20	SU 3	1	.0054	.0058		.00553	.3583E-07
		2	.0054	.0055			

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	US 1	1	.0063	.0062	.00625	.5000E-08

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	37.838
CHI-SQUARE(.95,29)	42.565

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

CA 3	BOTTLE- 2	T-CALC = 4.541	T-CRIT(.00147,32) = 3.480
CA 3	BOTTLE- 1	T-CALC = 3.982	T-CRIT(.00152,31) = 3.479

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

AU 2B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3A	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
BR 1	ZERO WITHIN-BOTTLE VARIANCE
CA 3	DOORNBOS' TEST FOR BOTTLE MEANS
SU 1	ZERO WITHIN-BOTTLE VARIANCE
US 1	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	13	.12332321E-04	.94864011E-06
BETWEEN BOTTLES	14	.77325000E-05	.55232143E-06
WITHIN BOTTLES	28	.91850000E-05	.32803571E-06
TOTAL	55	.29249821E-04	

F-CALC = 1.684 F-CRIT(.95;14,28) = 2.064

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	53.044
CHI-SQUARE(.95,20)	31.416

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

CA 3	C-CALC = .293	C-CRIT(4,21) = .212
SE 3	C-CALC = .221	C-CRIT(4,20) = .221
CA 1	C-CALC = .264	C-CRIT(4,19) = .230
SU 2	C-CALC = .328	C-CRIT(4,18) = .240

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

CA 3	R = .638	D-CRIT(21) = .477

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

CA 1	COCHRAN'S TEST FOR LABORATORY VARIANCE
CA 3	DIXON'S TEST FOR MEANS AND COCHRAN'S TEST FOR VARIANCE
SE 3	COCHRAN'S TEST FOR LABORATORY VARIANCE
SU 2	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 77-6

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	16	.14131111E-04	.88319444E-06
WITHIN LABS	55	.10240000E-04	.18618182E-06
TOTAL	71	.24371111E-04	

REPEATABILITY VARIANCE	.18618182E-06
REPEATABILITY STD. DEV.	.00043149
BETWEEN-LABORATORIES VARIANCE	.16590053E-06
BETWEEN-LABORATORIES STD. DEV.	.00040731
REPEATABILITY	.00122111
PERMISSIBLE TOLERANCE BETWEEN LABS	.00144022
GRAND MEAN	.00606111
VARIANCE OF THE GRAND MEAN	.13594690E-07

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS			LAB MEAN	LAB VARIANCE
1	AU 1A	1	.0226	.0227		.02208	.5025E-06
		2	.0212	.0218			
2	AU 1B	1	.0236	.0238		.02388	.4917E-07
		2	.0240	.0241			
3	AU 2A	1	.0185	.0184		.01788	.9825E-06
		2	.0182	.0164			
4	AU 2B	1	.0194			.01905	.2450E-06
		2	.0187				
5	AU 3A	1	.0247	.0228	.0233	.02163	.1257E-04
			.0163				
		2	.0245	.0247	.0202		
			.0165				
6	AU 3B	1	.0243	.0247	.0248	.02285	.3514E-05
			.0203				
		2	.0217	.0243	.0207		
			.0220				
7	BR 1	1	.0175	.0192		.01878	.7225E-06
		2	.0192	.0192			
8	BR 2	1	.0195	.0188		.01965	.4167E-06
		2	.0201	.0202			
9	BR 3	1	.0177	.0176		.01763	.6250E-07
		2	.0173	.0179			
10	CA 1	1	.0193	.0211		.01988	.1056E-05
		2	.0188	.0203			
11	CA 2	1	.0206	.0195		.02028	.9358E-06
		2	.0195	.0215			
12	CA 3	1	.0192	.0224		.02115	.1977E-05
		2	.0211	.0219			
13	CA 4	1	.0195	.0183		.02093	.5749E-05
		2	.0232	.0227			
14	ZA 1	1	.0223	.0215		.02248	.9225E-06
		2	.0223	.0238			
15	SE 2	1	.0220	.0217		.02190	.2000E-07
		2	.0220	.0219			
16	SE 3	1	.0183	.0173		.01918	.3569E-05
		2	.0217	.0194			
17	SU 1	1	.0198	.0192		.01923	.4425E-06
		2	.0183	.0196			
18	SU 1A	1	.0201	.0183		.01890	.7200E-06
		2	.0189	.0183			
19	SU 2	1	.0195	.0210		.02068	.7825E-06
		2	.0206	.0216			
20	SU 3	1	.0245	.0235		.02398	.5425E-06
		2	.0247	.0232			

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS		LAB MEAN	LAB VARIANCE
21	US 1	1	.0189	.0199	.01940	.5000E-06

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	30.436
CHI-SQUARE(.95,31)	44.991

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

AU 2B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3A	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
BR 1	ZERO WITHIN-BOTTLE VARIANCE
US 1	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 80-1

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	15	.21812937E-03	.14541958E-04
BETWEEN BOTTLES	16	.31570000E-04	.19731250E-05
WITHIN BOTTLES	32	.24620000E-04	.76937500E-06
TOTAL	63	.27431937E-03	

F-CALC = 2.565 F-CRIT(.95;16,32) = 1.972

BETWEEN-BOTTLE VARIANCE IS SIGNIFICANT
TEST SAMPLE IS PRESUMED TO BE INHOMOGENEOUS

ONE-WAY ANOVA CAN NOT BE PERFORMED
PRECISION ESTIMATES FROM TWO-WAY ANOVA

REPEATABILITY VARIANCE	.76937500E-06
REPEATABILITY STD. DEV.	.00087714
BETWEEN-LABORATORIES VARIANCE	.31422083E-05
BETWEEN-LABORATORIES STD. DEV.	.00177263
REPEATABILITY	.00248231
PERMISSIBLE TOLERANCE BETWEEN LABS	.00531475
GRAND MEAN	.02060313
VARIANCE OF THE GRAND MEAN	.22721810E-06

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS			LAB MEAN	LAB VARIANCE
1	AU 1A	1	.1234	.1244		.12338	.7358E-06
		2	.1223	.1234			
2	AU 2A	1	.1211	.1230		.12353	.6169E-05
		2	.1230	.1270			
3	AU 2B	1	.1200			.12050	.5000E-06
		2	.1210				
4	AU 3A	1	.1200	.1200	.1210	.12075	.2214E-05
			.1200				
		2	.1210	.1240	.1210		
			.1190				
5	AU 3B	1	.1200	.1210	.1270	.12288	.1070E-04
			.1270				
		2	.1200	.1190	.1240		
			.1250				
6	BR 1	1	.1210	.1210		.12125	.2500E-06
		2	.1220	.1210			
7	BR 2	1	.1270	.1250		.12625	.9167E-06
		2	.1260	.1270			
8	BR 3	1	.1240	.1280		.12650	.3000E-05
		2	.1270	.1270			
9	CA 1	1	.1240	.1250		.12500	.6667E-06
		2	.1250	.1260			
10	CA 2	1	.1270	.1270		.12550	.3000E-05
		2	.1240	.1240			
11	CA 3	1	.1260	.1240		.12375	.4250E-05
		2	.1240	.1210			
12	CA 4	1	.1300	.1220		.12625	.1225E-04
		2	.1280	.1250			
13	ZA 1	1	.1190	.1180		.11825	.2917E-05
		2	.1200	.1160			
14	SE 2	1	.1200	.1200		.12000	.2667E-05
		2	.1220	.1180			
15	SU 1	1	.1200	.1210		.12075	.2917E-05
		2	.1190	.1230			
16	SU 1A	1	.1130	.1140		.11350	.3333E-06
		2	.1130	.1140			
17	SU 2	1	.1180	.1190		.12025	.6917E-05
		2	.1200	.1240			
18	SU 3	1	.1250	.1200		.12175	.4917E-05
		2	.1210	.1210			
19	US 1	1	.1250	.1210		.12300	.8000E-05

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	13.817
CHI-SQUARE(.95,19)	30.148

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

AU 2B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3A	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
BR 1	ZERO WITHIN-BOTTLE VARIANCE
BR 3	ZERO WITHIN-BOTTLE VARIANCE
CA 2	ZERO WITHIN-BOTTLE VARIANCE
SE 2	ZERO WITHIN-BOTTLE VARIANCE
SU 3	ZERO WITHIN-BOTTLE VARIANCE
US 1	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	9	.57304100E-03	.63671222E-04
BETWEEN BOTTLES	10	.30305000E-04	.30305000E-05
WITHIN BOTTLES	20	.83910000E-04	.41955000E-05
TOTAL	39	.68725600E-03	

F-CALC = .722 F-CRIT(.95;10,20) = 2.348

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	26.102
CHI-SQUARE(.95,18)	28.877

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

SU 1A R = .510 D-CRIT(19) = .501

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

SU 1A DIXON'S TEST FOR LABORATORY MEANS

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 83-9

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	17	.42018789E-03	.24716935E-04
WITHIN LABS	58	.25359000E-03	.43722414E-05
TOTAL	75	.67377789E-03	

REPEATABILITY VARIANCE	.43722414E-05
REPEATABILITY STD. DEV.	.00209099
BETWEEN-LABORATORIES VARIANCE	.48532762E-05
BETWEEN-LABORATORIES STD. DEV.	.00220302
REPEATABILITY	.00591750
PERMISSIBLE TOLERANCE BETWEEN LABS	.00750852
GRAND MEAN	.12270526
VARIANCE OF THE GRAND MEAN	.36001901E-06

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS			LAB MEAN	LAB VARIANCE
1	AU 1A	1	.8681	.8709		.86900	.1640E-05
		2	.8685	.8685			
2	AU 2A	1	.8250	.8350		.83550	.6767E-04
		2	.8450	.8370			
3	AU 2B	1	.8680			.86400	.3200E-04
		2	.8600				
4	AU 3A	1	.8110	.8600	.8530	.85000	.3046E-03
			.8490				
		2	.8660	.8600	.8420		
			.8590				
5	AU 3B	1	.8460	.8470	.8650	.85025	.1914E-03
			.8560				
		2	.8420	.8520	.8690		
			.8250				
6	BR 1	1	.8380	.8560		.84600	.7200E-04
		2	.8500	.8400			
7	BR 2	1	.8970	.9090		.90325	.3225E-04
		2	.9000	.9070			
8	BR 3	1	.8640	.8640		.86050	.1700E-04
		2	.8560	.8580			
9	CA 1	1	.8720	.8640		.86800	.5333E-04
		2	.8760	.8600			
10	CA 2	1	.8830	.8730		.86800	.8760E-03
		2	.8250	.8910			
11	CA 3	1	.8370	.8050		.81925	.1763E-03
		2	.8190	.8160			
12	CA 4	1	.8680	.8580		.87125	.1209E-03
		2	.8750	.8840			
13	ZA 1	1	.8650	.8530		.86125	.3892E-04
		2	.8670	.8600			
14	SE 2	1	.8360	.8490		.84400	.6867E-04
		2	.8530	.8380			
15	SU 1	1	.8510	.8530		.85525	.1892E-04
		2	.8560	.8610			
16	SU 1A	1	.8610	.8540		.85325	.3292E-04
		2	.8500	.8480			
17	SU 2	1	.8680	.8660		.86675	.8917E-05
		2	.8700	.8630			
18	SU 3	1	.8480	.8510		.84900	.2000E-05
		2	.8480	.8490			
19	US 1	1	.8670			.86700	.0000E+00

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	30.973
CHI-SQUARE(.95,25)	37.660

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

AU 1A	ZERO WITHIN-BOTTLE VARIANCE
AU 2B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3A	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
BR 3	ZERO WITHIN-BOTTLE VARIANCE
US 1	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	12	.19822731E-01	.16518942E-02
BETWEEN BOTTLES	13	.95475000E-03	.73442308E-04
WITHIN BOTTLES	26	.37515000E-02	.14428846E-03
TOTAL	51	.24528981E-01	

F-CALC = .509 F-CRIT(.95;13,26) = 2.119

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	49.515
CHI-SQUARE(.95,17)	27.593

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

CA 2 C-CALC = .414 C-CRIT(4,18) = .240

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

BR 2 R = .578 D-CRIT(18) = .514

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

BR 2	DIXON'S TEST FOR LABORATORY MEANS
CA 2	COCHRAN'S TEST FOR LABORATORY VARIANCE
US 1	LABORATORY SUBMITTED ONLY ONE RESULT

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-8

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	15	.11266343E-01	.75108952E-03
WITHIN LABS	54	.55409200E-02	.10260963E-03
TOTAL	69	.16807263E-01	

REPEATABILITY VARIANCE	.10260963E-03
REPEATABILITY STD. DEV.	.01012964
BETWEEN-LABORATORIES VARIANCE	.14932103E-03
BETWEEN-LABORATORIES STD. DEV.	.01221970
REPEATABILITY	.02866688
PERMISSIBLE TOLERANCE BETWEEN LABS	.04008481
GRAND MEAN	.85322857
VARIANCE OF THE GRAND MEAN	.11826903E-04

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

LABORATORY NO.	COUNTRY	BOTTLE NO.	ANALYTICAL RESULTS PHOSPHORUS			LAB MEAN	LAB VARIANCE
1	AU 1A	1	1.5040	1.5000		1.49775	.3492E-04
		2	1.4900	1.4970			
2	AU 2A	1	1.4130	1.3880		1.38050	.2475E-02
		2	1.3080	1.4130			
3	AU 2B	1	1.4920			1.48500	.9800E-04
		2	1.4780				
4	AU 3A	1	1.4720	1.4920	1.4720	1.47763	.5014E-03
			1.4520				
		2	1.5150	1.4950	1.4750		
			1.4480				
5	AU 3B	1	1.4650	1.4620		1.46960	.8030E-04
		2	1.4680	1.4680	1.4850		
6	BR 1	1	1.4380	1.5380		1.49425	.2656E-02
		2	1.5380	1.4630			
7	BR 2	1	1.5420	1.5530		1.54875	.2492E-04
		2	1.5520	1.5480			
8	BR 3	1	1.4440	1.4330		1.44225	.3892E-04
		2	1.4460	1.4460			
9	CA 1	1	1.5120	1.4840		1.50050	.1390E-03
		2	1.5030	1.5030			
10	CA 2	1	1.4930	1.4960		1.50200	.4447E-03
		2	1.4860	1.5330			
11	CA 3	1	1.4980	1.4200		1.45200	.1112E-02
		2	1.4380	1.4520			
12	CA 4	1	1.4600	1.4950		1.50075	.1166E-02
		2	1.5050	1.5430			
13	ZA 1	1	1.4790	1.4340		1.46575	.6442E-03
		2	1.4920	1.4580			
14	SE 2	1	1.4550	1.4140		1.43400	.5887E-03
		2	1.4550	1.4120			
15	SU 1	1	1.4320	1.4440		1.43550	.3500E-04
		2	1.4310	1.4350			
16	SU 1A	1	1.4350	1.4400		1.42150	.4497E-03
		2	1.3930	1.4180			
17	SU 2	1	1.4700	1.4620		1.46625	.3092E-04
		2	1.4720	1.4610			
18	SU 3	1	1.4900	1.4920		1.47750	.2463E-03
		2	1.4660	1.4620			
19	US 1	1	1.4710	1.4510		1.46100	.2000E-03

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

BARTLETT'S TEST FOR HOMOGENEITY OF BOTTLE VARIANCE

CALCULATED STATISTIC	35.967
CHI-SQUARE(.95,25)	37.660

VARIANCE IS HOMOGENEOUS
(COCHRAN'S TEST NOT PERFORMED)

DOORNBOS' TEST FOR BOTTLE MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR TWO-WAY ANOVA

AU 2B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3A	NUMBER OF BOTTLES OR REPLICATES INCORRECT
AU 3B	NUMBER OF BOTTLES OR REPLICATES INCORRECT
BR 3	ZERO WITHIN-BOTTLE VARIANCE
CA 1	ZERO WITHIN-BOTTLE VARIANCE
US 1	NUMBER OF BOTTLES OR REPLICATES INCORRECT

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

TWO-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	12	.90816192E-01	.75680160E-02
BETWEEN BOTTLES	13	.65395000E-02	.50303846E-03
WITHIN BOTTLES	26	.23185000E-01	.89173077E-03
TOTAL	51	.12054069E+00	

F-CALC = .564 F-CRIT(.95;13,26) = 2.119

TEST SAMPLE IS HOMOGENEOUS

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

BARTLETT'S TEST FOR HOMOGENEITY OF LABORATORY VARIANCE

CALCULATED STATISTIC	45.164
CHI-SQUARE(.95,18)	28.877

VARIANCE IS INHOMOGENEOUS

COCHRAN'S TEST FOR LABORATORY VARIANCE (ALPHA=.05)

BR 1	C-CALC = .242	C-CRIT(4,19) = .230
AU 2A	C-CALC = .298	C-CRIT(4,18) = .240

DIXON'S TEST FOR LABORATORY MEANS (ALPHA=.05)

NONE REJECTED

LIST OF LABORATORIES WHOSE RESULTS WERE NOT USED FOR ONE-WAY ANOVA

AU 2A	COCHRAN'S TEST FOR LABORATORY VARIANCE
BR 1	COCHRAN'S TEST FOR LABORATORY VARIANCE

LIST OF INDIVIDUAL OUTLIERS DETECTED BY DIXON'S TEST WITHIN-LABORATORIES

NONE REJECTED

ISO/TC 102/SC 2/WG 28A PHOSPHORUS BY MOLYBDENUM BLUE SPECTROPHOTOMETRIC METHOD
SAMPLE: 85-9

ONE-WAY ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES	MEAN SQUARE
BETWEEN LABS	16	.64014367E-01	.40008979E-02
WITHIN LABS	52	.18993575E-01	.36526106E-03
TOTAL	68	.83007942E-01	

REPEATABILITY VARIANCE	.36526106E-03
REPEATABILITY STD. DEV.	.01911180
BETWEEN-LABORATORIES VARIANCE	.90075025E-03
BETWEEN-LABORATORIES STD. DEV.	.03001250
REPEATABILITY	.05408641
PERMISSIBLE TOLERANCE BETWEEN LABS	.09314874
GRAND MEAN	1.47302899
VARIANCE OF THE GRAND MEAN	.62997656E-04